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EDITORIAL INDEX—PAGE 167.
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School of Practical Science
A. T. Laing
Toronto

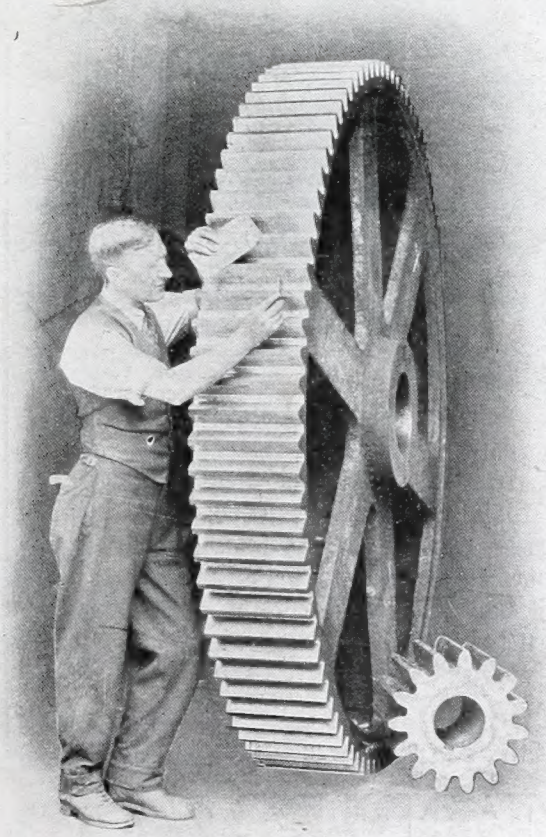
CANADIAN MACHINERY AND MANUFACTURING NEWS

The Maclean Publishing Company, Limited, Toronto, Montreal, Winnipeg, New York, Chicago, Boston, and London, Eng.

Vol. XVIII—No. 14 Publication Office: Toronto, October 4, 1917 Subscription Price $3.00 per Year

Good Cut Gears

CUT GEARS



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Write or Phone for Quotations

Hamilton Gear & Machine Co.

Van Horne Street, TORONTO

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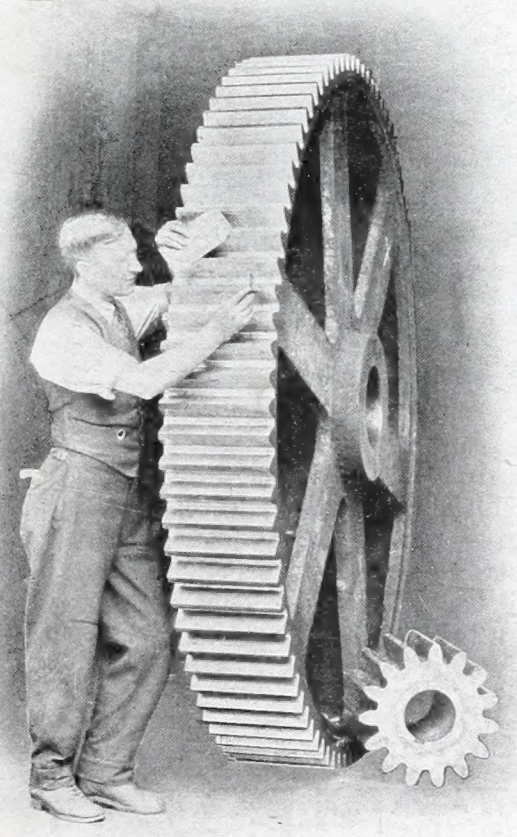

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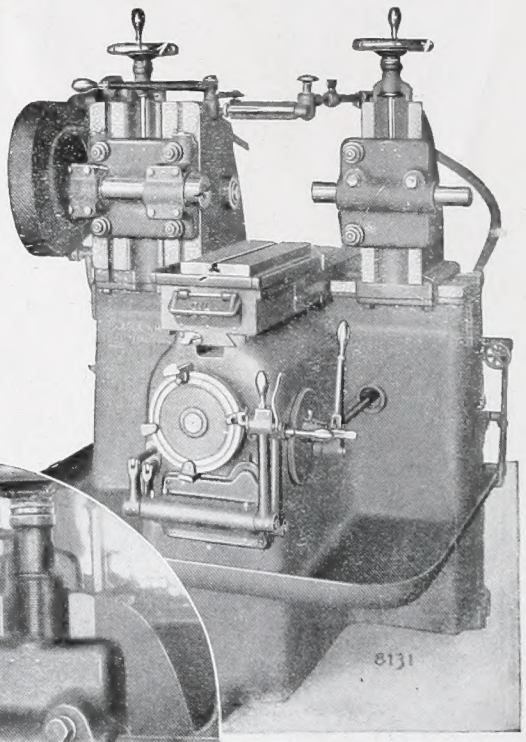
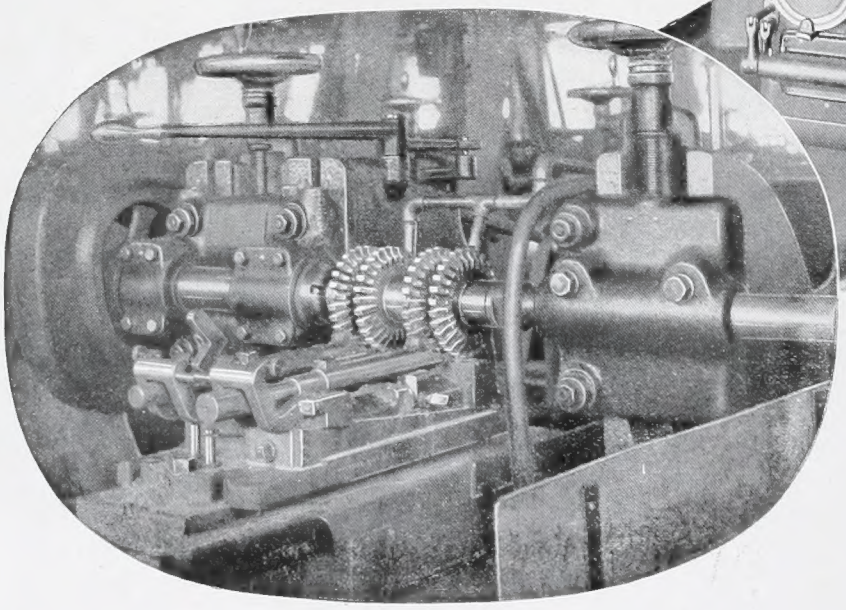
A high production manufacturing tool of extreme accuracy; automatic in operation and especially adapted to the diversified milling requirements of fire arms production and similar work.





At Work on Military Rifles

Illustration shows straddle milling operation on sides of receivers. Two receivers are handled at one time.

Pratt & Whitney Automatic Millers are built in 5-inch, 8-inch and 12-inch sizes. The table has rapid power traverse in either direction, automatically controlled. The table receding feature operates automatically and permits the work to clear the cutter on the return stroke and, therefore, prevents marring of the finished surface. Automatic features of these machines eliminate usual hand operations. One man can take care of from six to eight machines, depending on the character of the work. Practically all the operator has to do is to supply the machine with work.

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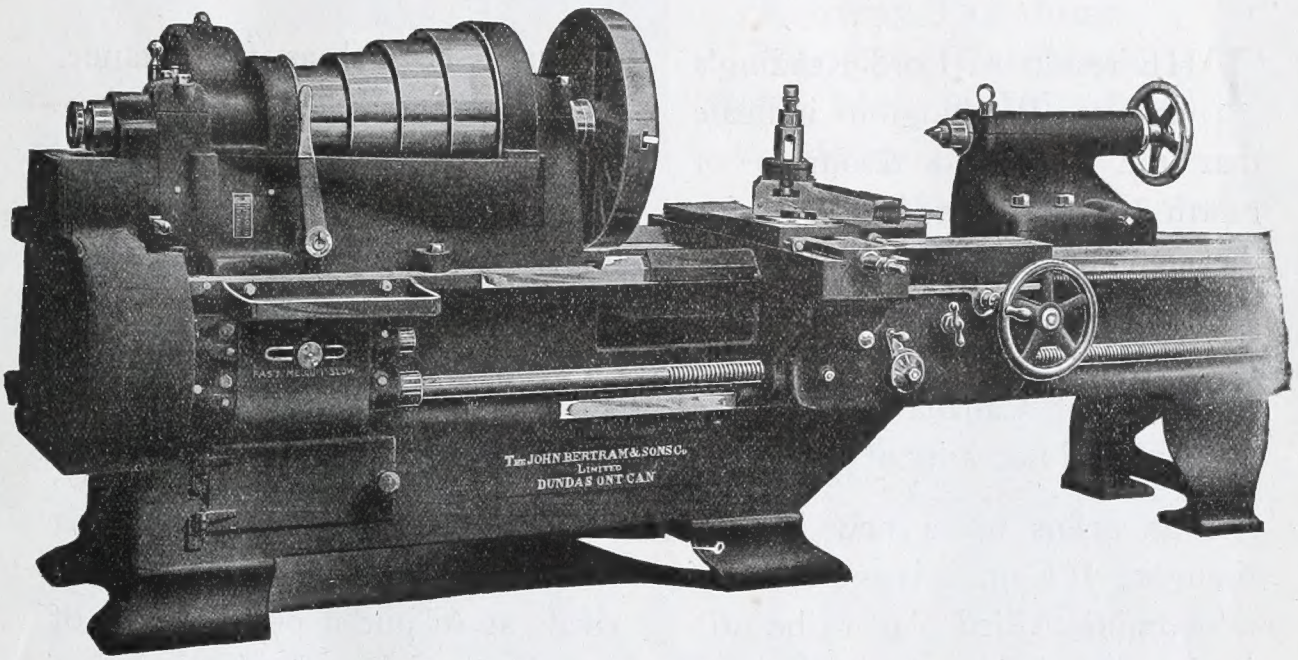

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The Publisher's Page

TORONTO October 4, 1917

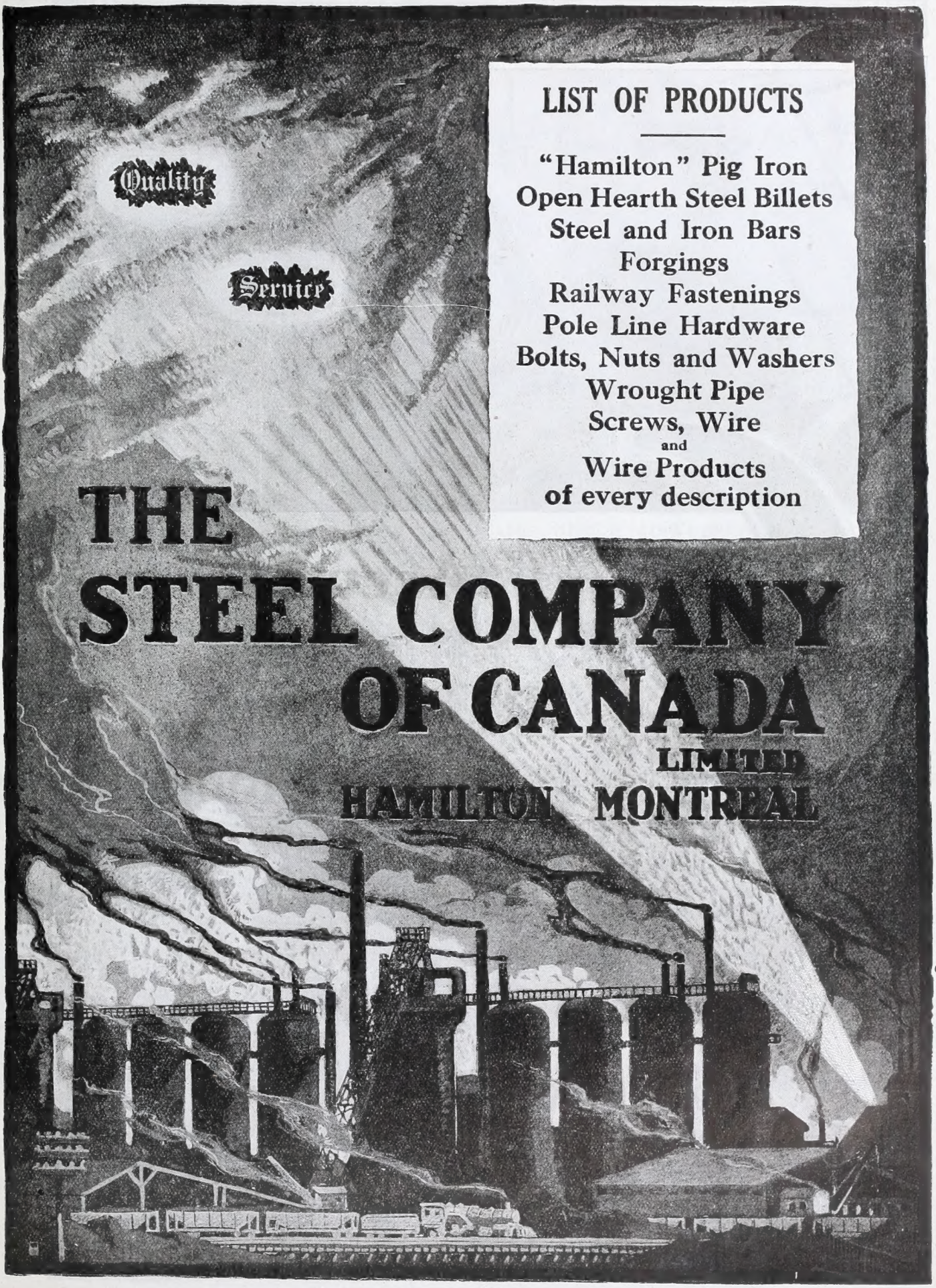
THE results of Lord Reading's visit to Washington indicate that the combined resources of North America are to be pooled for the common benefit of the Allies. Although the arrangement results from American co-operation, the resources of Canada constitute a fundamental necessity of it.

This opens up a new line of thought. If Canada is as a result of a sweeping Allied plan to be utilized to the fullest possible extent, the thought occurs that this plan may operate to Canadian benefit in conjunction with another general outcome of the war.

We refer to the constantly growing tendency toward centralization, specialization and the elimination of the wasted effort of long hauls and complicated distribution methods. The tendency of large manufacturing interests, such as, for instance, the United States Steel Corporation, is towards the turning out of the finished product as close as possible to the source of raw supply.

Canada ranks with Russia and China as the world's greatest reservoir of the raw material of many principal industries. Economically, industrially and politically, Canada is so far ahead of these principal rivals as to put it on the basis of actual potential production in a class by itself.

It is for this reason that thoughtful observers see for this country a great manufacturing growth that renders the establishment of a good connection here now most advisable on the part of those manufacturers who seek the line of least resistance for the development of their own interests.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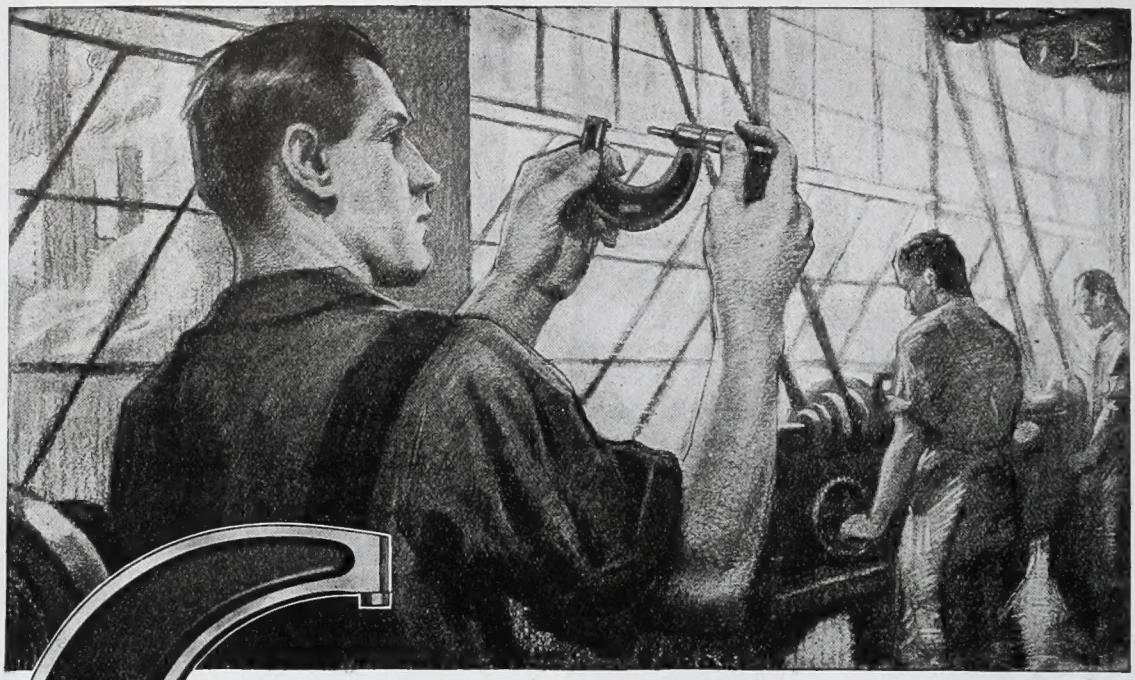

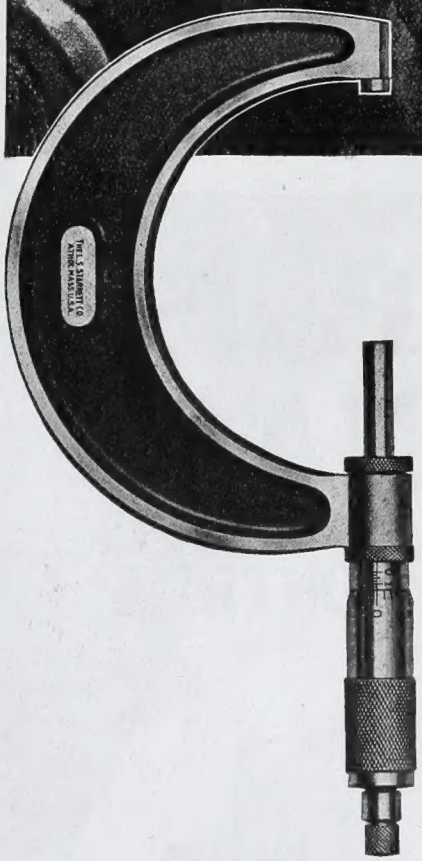

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Are your precision tools your best friends or your worst enemies? If you are never sure of the reading or if they wear easily and rapidly, you have to guess, and guessing produces seconds and makes thin pay envelopes.

If you use

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you can be *sure* all the time. If a Starrett Micrometer reads .808 you know that the piece is exactly that diameter or thickness.

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Ask for Catalog No. 213.

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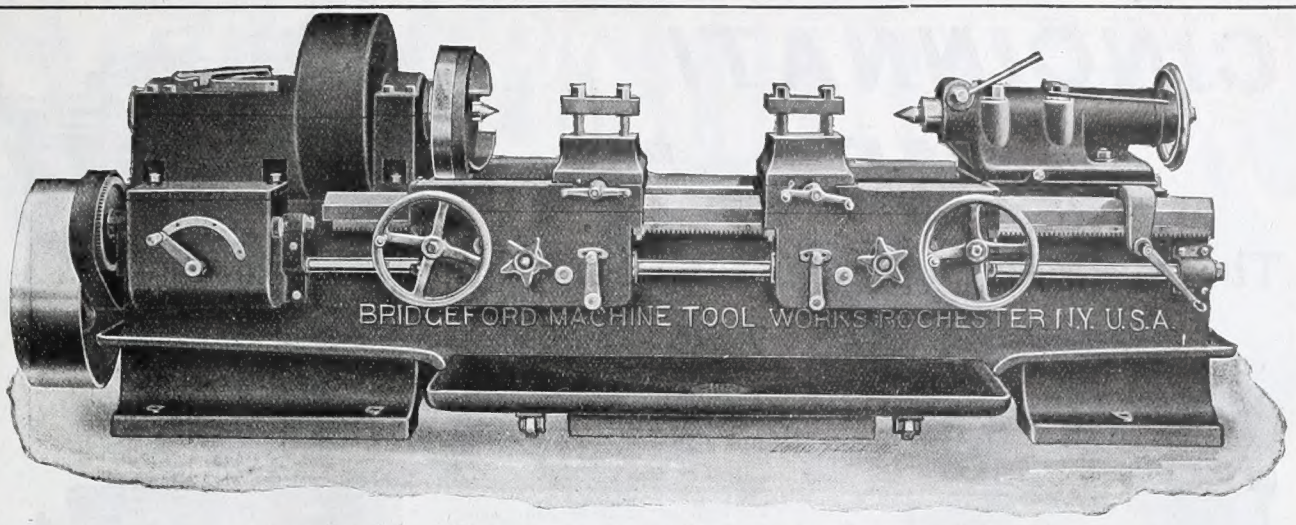

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Why pay the extra cost for a screw cutting lathe, when a rapid production lathe is the machine you need? If your work is largely heavy forgings and shafts, put the extra cost into another carriage and double your production. Just look at the proportions of the

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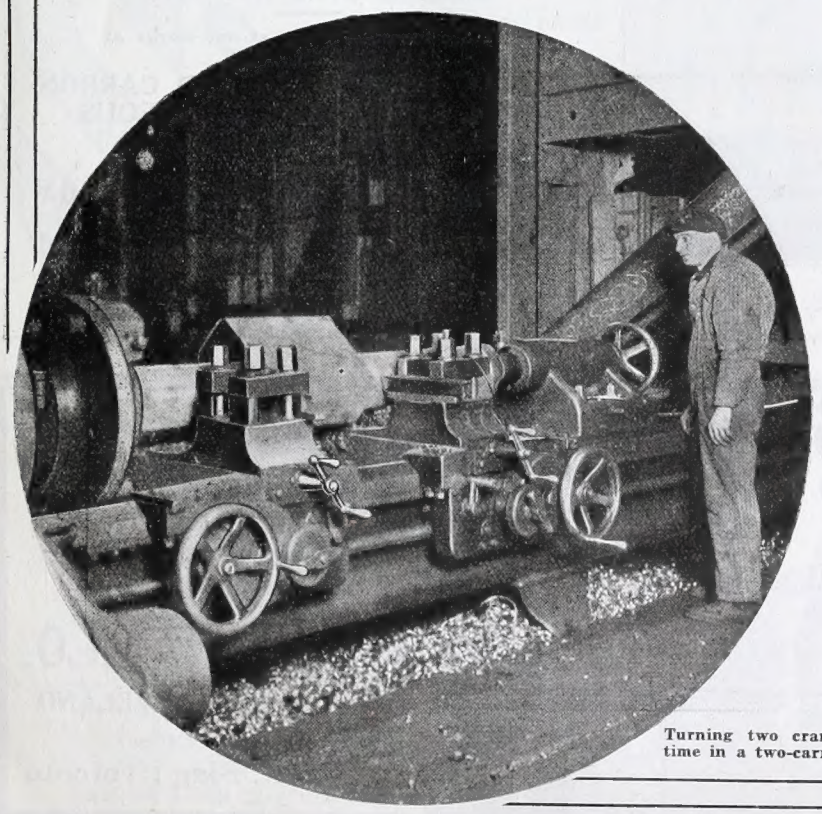

Turning two crank shaft bearings at the same time in a two-carriage Bridgeford.

Look at its size. There's strength there. It's a heavy duty lathe in the full meaning of the words.

Note the simplicity of its design. This elimination of all complicated mechanism makes an expert of an inexperienced operator. We have a few—a very few—available for early delivery.

Better write for particulars today.

Bridgeford Machine Tool Works

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ROCHESTER, N.Y., U.S.A.

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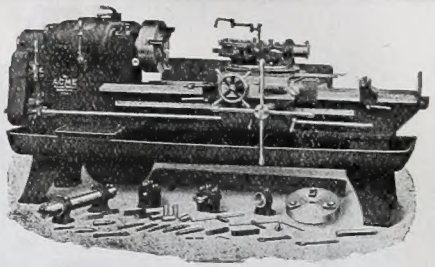
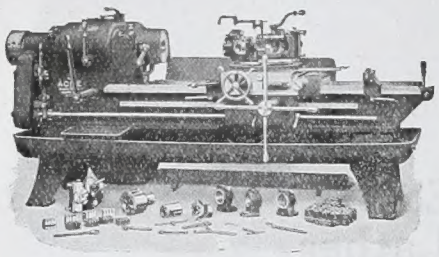
Fast, Accurate

Three Widely Used Turret Lathes



3¼"x36" Flat Turret Lathe with Chucking Equipment.

Cincinnati Acme flat turret lathes meet the most exacting demands for accuracy, convenience in operation and maximum production.

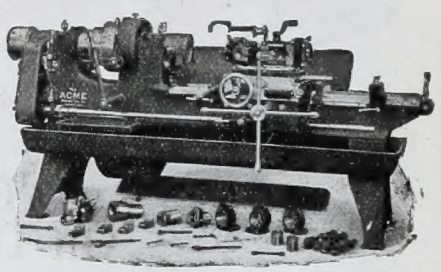


3¼"x36" Flat Turret Lathe with Bar Equipment.

A few of the meritorious features:

CROSS SLIDING TURRET revolves on hardened and ground stem of large diameter, and is automatically locked into position by hardened and ground tool steel taper plunger placed directly underneath cutting tool. OILING ARRANGEMENT provided so that oil can be fed to each individual tool. CROSS SLIDE moves on long, narrow, dovetail guide with wide, flat bearing surfaces on either side, and has adjustable taper gib to compensate for wear. SADDLE has continuous bearing on two exceptionally heavy vees on bed, and carries swinging stock stop (adjustable), attached to front.

Send for full details.



2¼"x26" Flat Turret Lathe with Bar Equipment.

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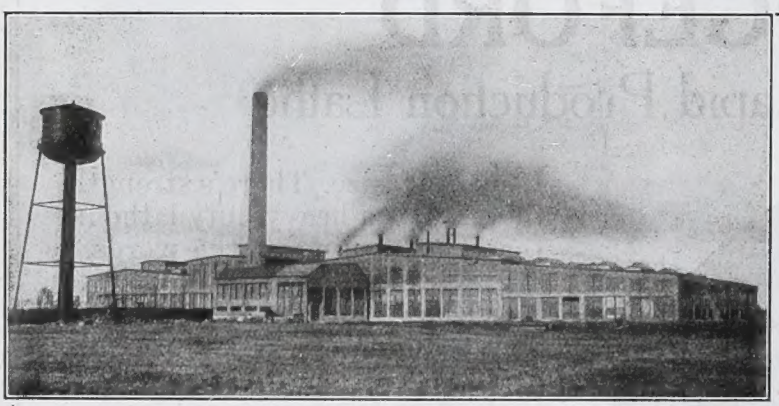

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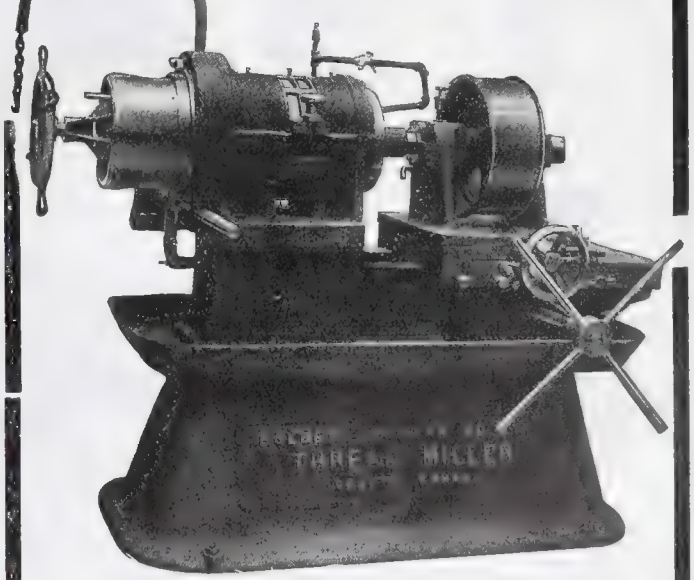

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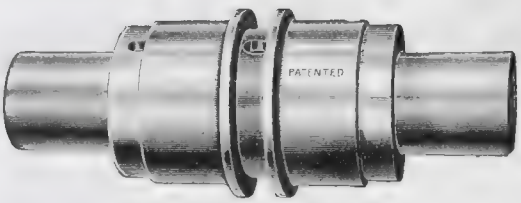

Double Clutch—Exterior.

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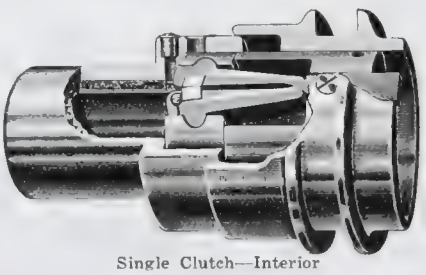
We've been writing our ads to Machine Tool Manufacturers for the past few months. We've been telling you and showing you what Johnson Friction Clutches are doing for many of the Machine Tool Builders who are your business neighbors.

If you are a Machine Tool Builder and are not convinced that "Johnsons" are the clutches to use, it's our fault because we have just the evidence that will convince you in our files.

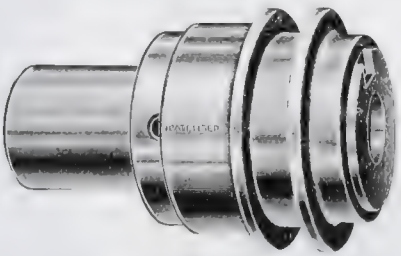
Let's talk about Clutches. Anyway, write to-day for the Blue Catalog.

Send for Our Booklet, "Clutches as Applied in Machine Building," and Yellow Data Sheets.

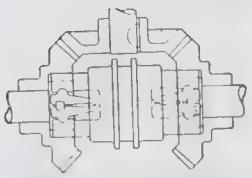


Single Clutch—Interior

Pulley mounted on Clutch Hub



Single Clutch Exterior



Double Clutch in Nest of Gears

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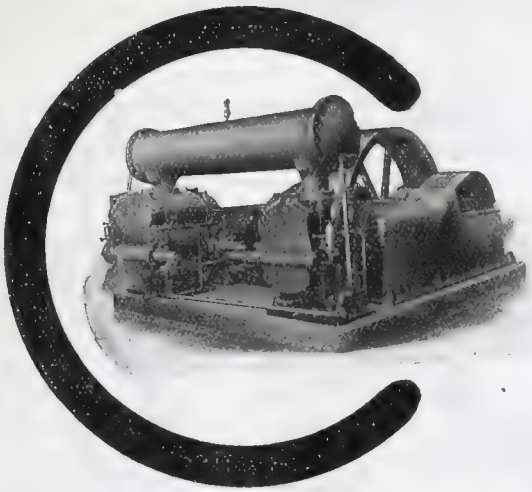
THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.



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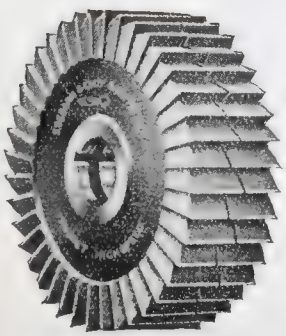

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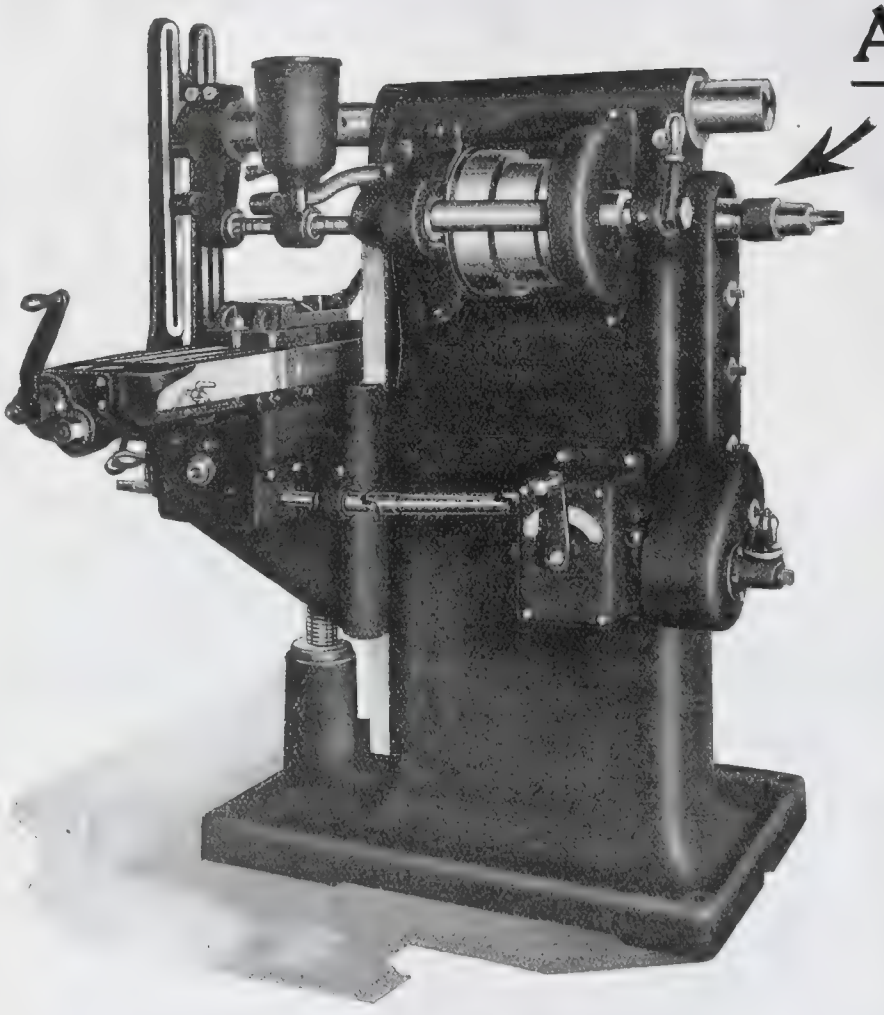

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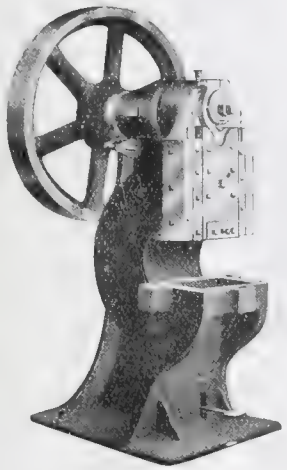

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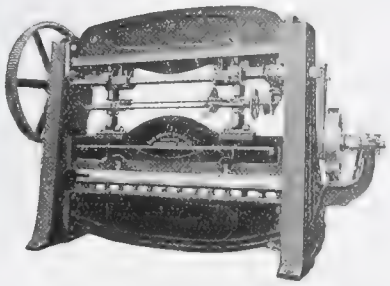

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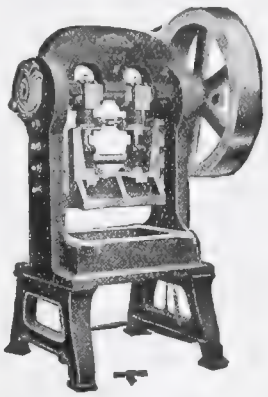

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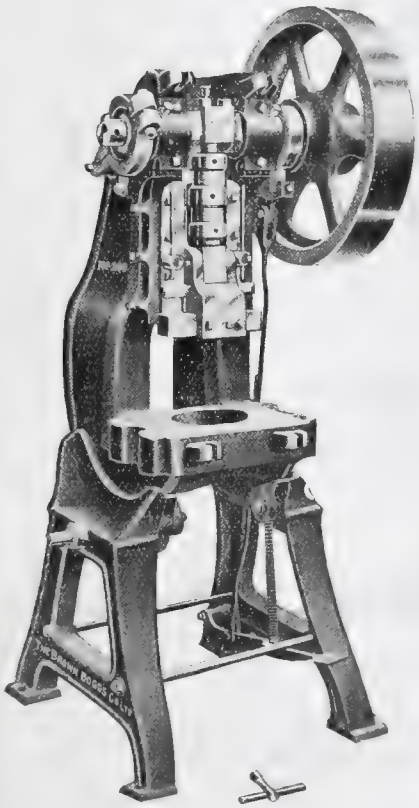

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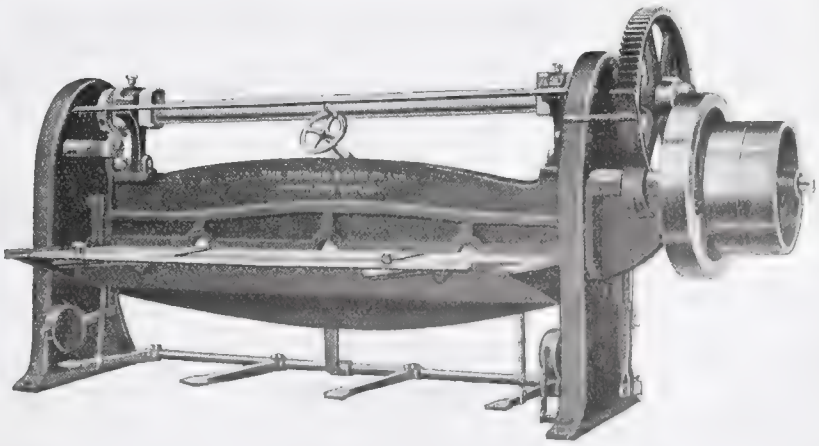

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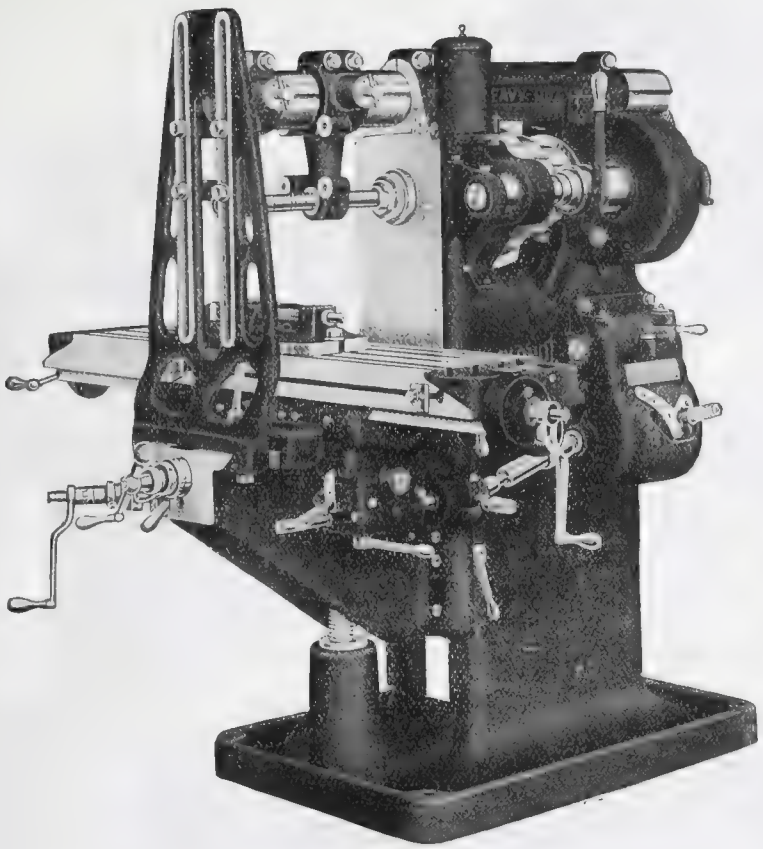

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70 Lombard Street Toronto, Ontario

One of the

Steels of the Century

Centurion High-Speed

Made from the **BEST** Materials

Iron, Tungsten, Chrome, Vanadium

Melted by the **BEST** Process

The Crucible Furnace Method

Handled by the **BEST** Workmen

Melters, Forgemen, Annealers, Metallurgists

CONSEQUENTLY

Will do the **BEST** Work

Quality ***Delivery*** ***Service***

We have a catalog waiting for you. Write for it.

THE CENTURY STEEL CO. OF AMERICA

MANUFACTURERS OF HIGH-GRADE CRUCIBLE STEELS

General Office and Works:
POUGHKEEPSIE, N.Y.

Sales Offices:
120 BROADWAY, NEW YORK

If what you need is not advertised consult our Buyers' Directory and write advertisers listed under proper heading.

HIGHEST IN QUALITY NATIONALLY KNOWN

Our Country requires the extreme limit of production from every lathe, planer, miller or other machine tool

BE PATRIOTIC

"Red Cut Superior"

The Nationally Known First Quality

HIGH SPEED STEEL

Will enable you greatly to increase your output

"IT'S THE BEST FOR ALL MACHINE WORK"

VANADIUM-ALLOYS STEEL CO.

PITTSBURGH, PA. Works at LATROBE, PA.

CARRIED IN STOCK AT THESE WAREHOUSES:

E. T. WARD'S SONS, 44 FARNSWORTH ST., BOSTON, MASS.

GEO. NASH CO., 304 HUDSON ST., NEW YORK, N. Y.

FIELD & CO., INC., 721 ARCH ST., PHILADELPHIA, PA

VANADIUM ALLOYS STEEL CO., PITTSBURGH, PA., AND LATROBE, PA.

GEO. NASH CO., 646 WASHINGTON BLV'D., CHICAGO, ILL

If any advertisement interests you, tear it out now and place with letters to be answered.

Economy Uniformity

1 AMACOL
2 TENAXAS
3 DURASTIC
4 TIN-TOUGHENED
5 ADAMUS
6 ATLAS
7 MASCOT
8 W.E.W. BABBITT

Whatever your needs in bearing metals, there is an ATLAS line that will SATISFY you.

ALTAS METAL & ALLOYS COMPANY OF CANADA, LIMITED, MONTREAL

Sales Agents;

The Canadian B. K. Morton Co., Limited

MONTREAL: 49 Common Street TORONTO: 86 Richmond Street East

FERRO-URANIUM *The Latest Discovery in Alloys for Efficient*

High-Speed and Other Steels of Quality

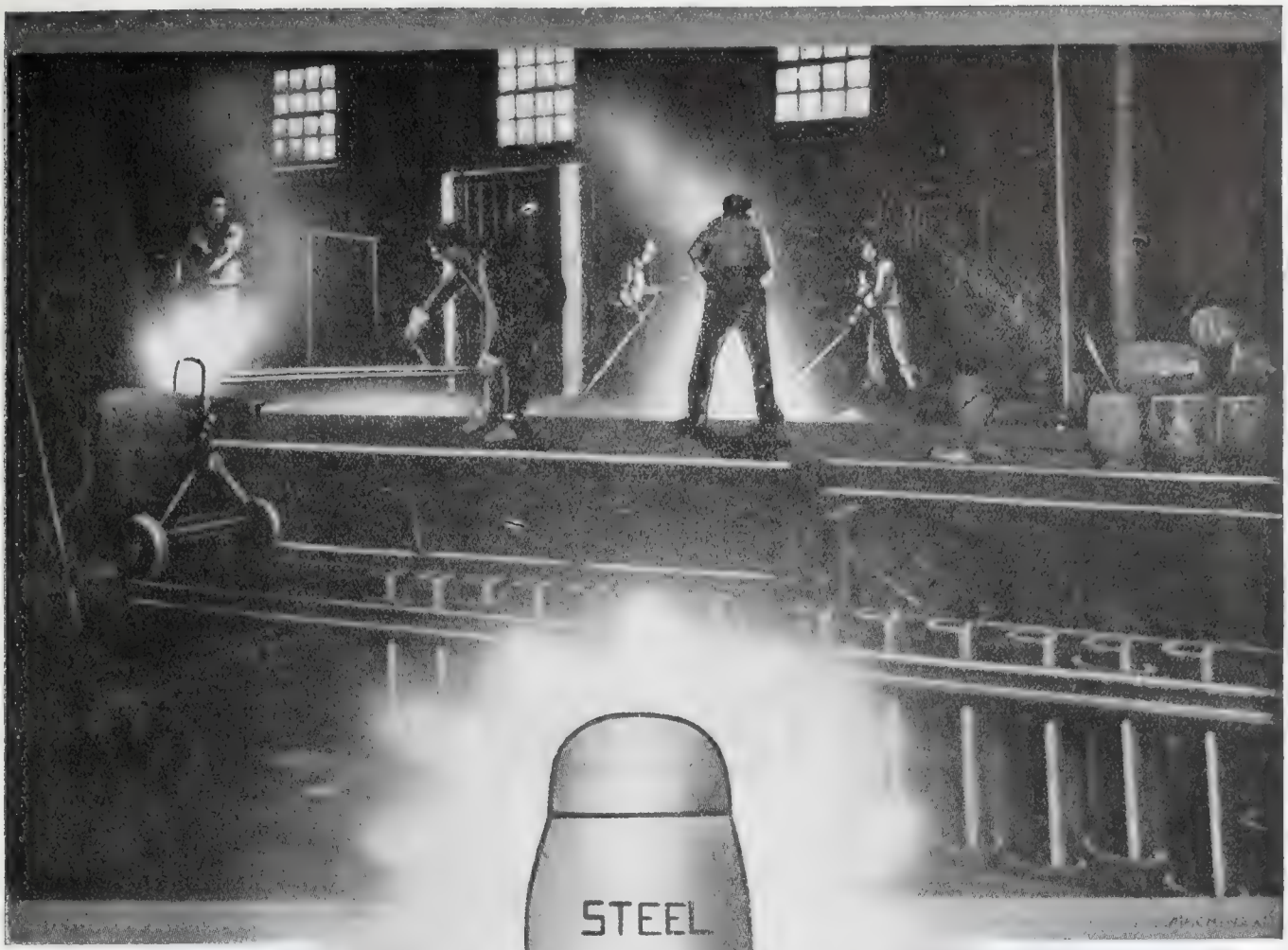
IT INSURES TOOLS THAT STAND UP ON THE JOB

Largest Producers in the World of URANIUM

WRITE US FOR PARTICULARS

STANDARD ALLOYS COMPANY

Forbes and Meyran Aves. -:- Pittsburgh, Pa.



WOLFRAM
HIGH SPEED STEEL

is of uniform high quality and may be worked down to the last ounce without variation. Wolfram is ready for prompt delivery.

Vulcan Crucible Steel Company

ALIQUIPPA *Established 1900* PA., U.S.A.

Makers of Wolfram High Speed Steel

Represented in Canada by Messrs Norton, Callard & Co., Herald Bldg., Montreal

If any advertisement interests you, tear it out now and place with letters to be answered.

DIAMONDS

LANDIS NORTON

All sizes, finest quality, awaiting your command, stones

"THAT SUIT"

either unmounted or mounted in our improved (any style) CAST STEEL MOUNTING;

GUARANTEED TO BRING RESULTS.

"MADE IN CANADA"

WHEEL TRUEING TOOL CO.

88 WEST PITT STREET WINDSOR, ONTARIO

For Export and Import—

Iron — Steel — Metals

Machinery, Raw Products and Manufactured Goods

A. G. KIDSTON & CO.

with offices in

LONDON GLASGOW MONTREAL NEW YORK
AUSTRALIA NEW ZEALAND SOUTH AFRICA

and connections all over the civilized world, have exceptional advantages for the marketing of Canadian and other products. Enquiries invited and promptly handled.

Manager for Canada and U.S.A.:
C. E. GAUSDEN, 17 ST. JOHN STREET, MONTREAL

Cables: "KIDCO," Montreal

Nova Scotia Steel & Coal Company

Limited

New Glasgow, Nova Scotia, Canada

4,000 TON STEAM HYDRAULIC FORGING PRESS FOR MARINE AND OTHER HEAVY FORGINGS

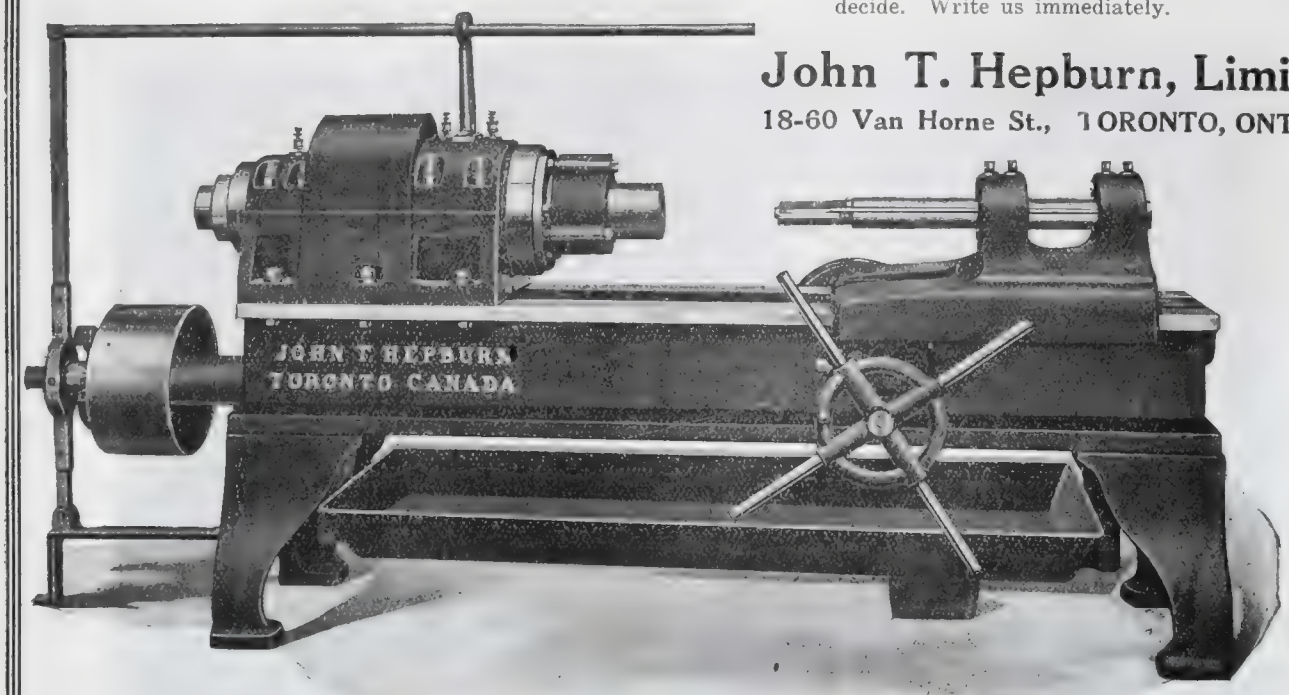
The product of a modern steam-hydraulic press is denser and more homogeneous than can be obtained with the steam hammer, due to the effect of the blow of the latter not penetrating to the centre, in contradistinction to the uniform kneeding effect of the press; while the amount of work that can be done by the latter at one time with little variation in temperature, strongly tends toward a better product. The greater uniformity and reliability of steam hydraulic forgings make their use imperative wherever high-class products are required.

Renew Your Old Lathe

Not necessarily by securing a new one but take advantage of our thoroughly equipped machine shop. We repair lathes, plane the lathe beds. We build lathes and in our repairing the same care is exercised. If you intend securing a new lathe, get a list of the Hepburn line before you to help you decide. Write us immediately.

John T. Hepburn, Limited

18-60 Van Horne St., TORONTO, ONTARIO

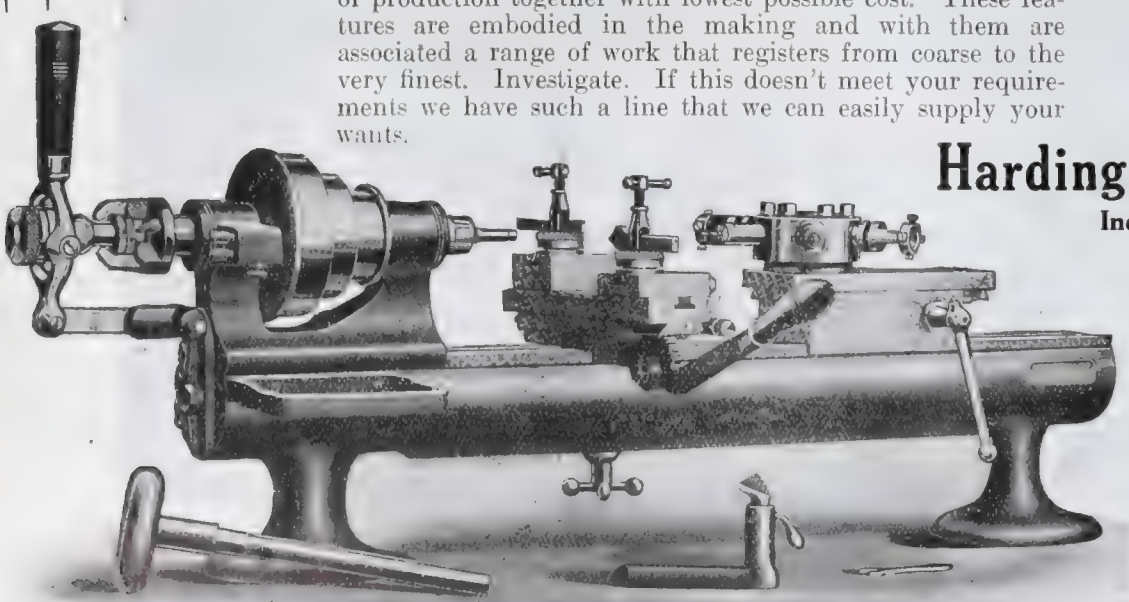


If it is a Question of Efficiency

There are lathes that will give you all grades of efficiency. But we interpret efficiency to mean highest speed and quality of production together with lowest possible cost. These features are embodied in the making and with them are associated a range of work that registers from coarse to the very finest. Investigate. If this doesn't meet your requirements we have such a line that we can easily supply your wants.

Hardinge Bros.
Inc.

1770 Berteau Avenue,
CHICAGO, ILL., U.S.A.



Roelofson 6-in. Banding Machine

YOU couldn't imagine a more sturdy, compact, serviceable machine than this! A glance at the illustration will show you for yourself. It has been used in Canadian munition plants since the munition business started, and is still giving absolute satisfaction. It's the machine you need if you make shells.

Look over the following outstanding features of its construction:

Integral (en bloc) construction assures perfect rigidity, permanent accuracy and desirable compactness.

Chucking with spring collet chuck insures accurate and speedy checking.

Graduated feed dial, two cutting tools, and ample belt power insure output of accurate work in least possible time.

Machines are built for 15, 18, 60-pdr. and 6″ shells.

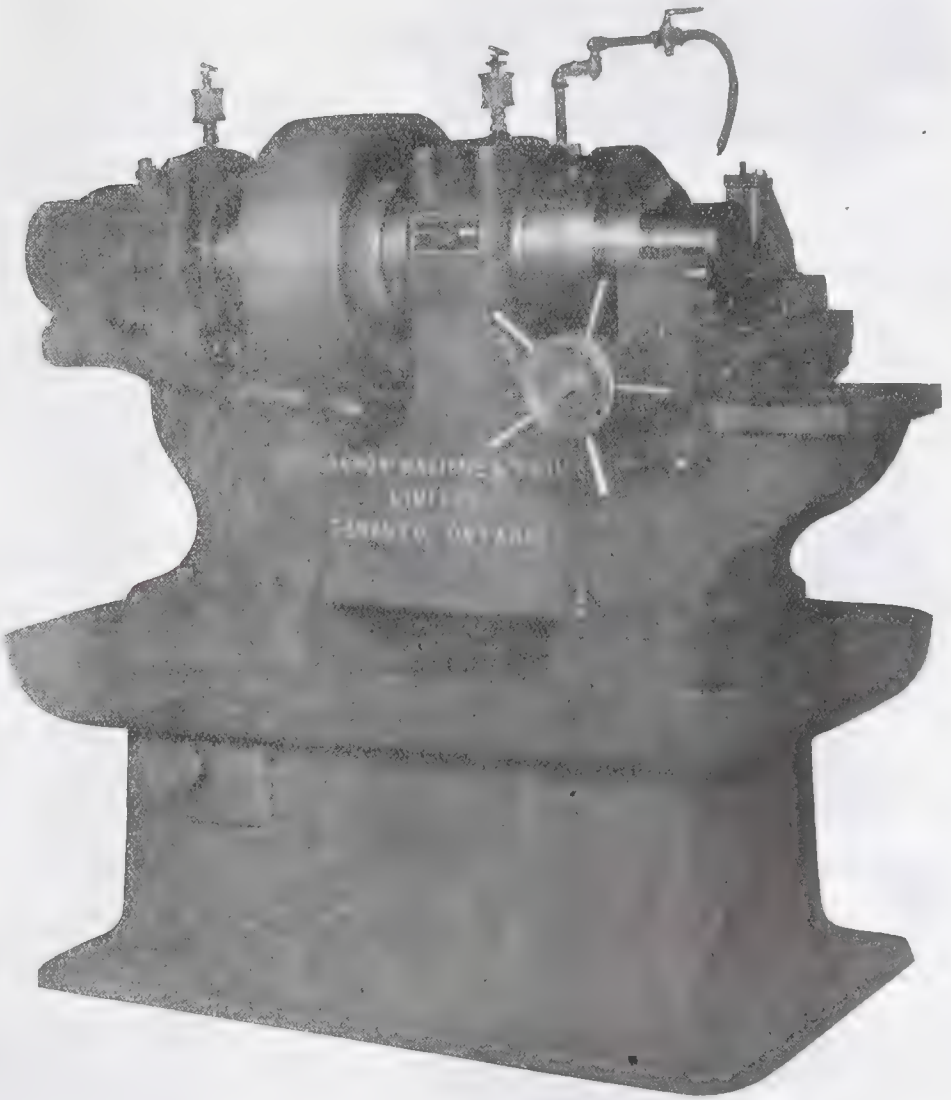
Roelofson Machine & Tool Co., Ltd.

Head Office: 1501 Royal Bank Building, Toronto, Canada
Works and Warehouse: Galt, Ont., Canada

Immediate Delivery

To shell plants changing over from the manufacture of the larger sizes to 6″ shells, our ability to make **immediate delivery** should be of especial interest.

And remember that the Roelofson is one of the few banding machines that have stood up from the first of the munition game and are still doing duty.



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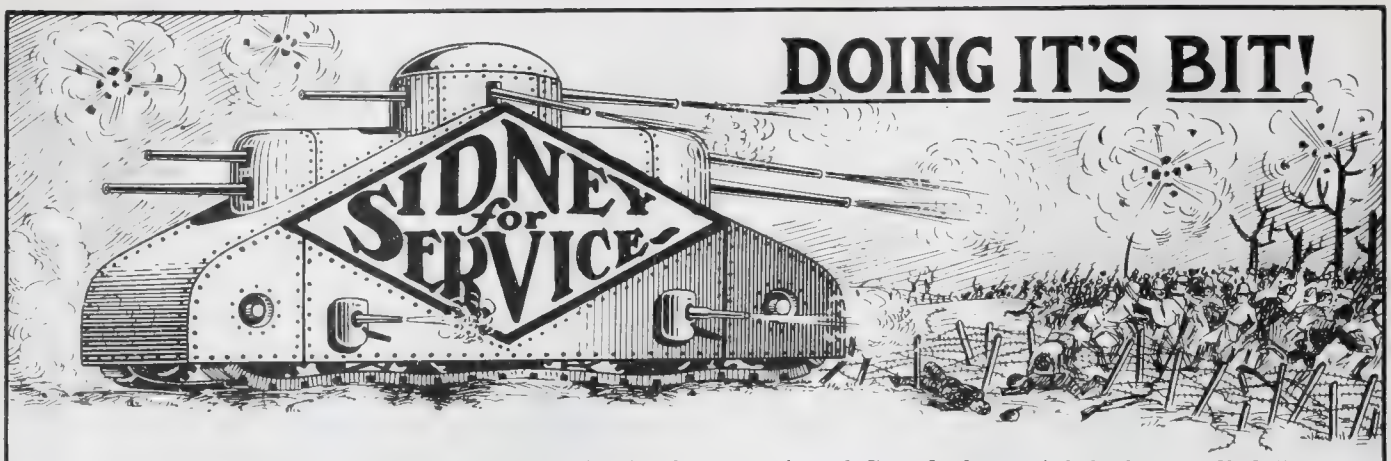
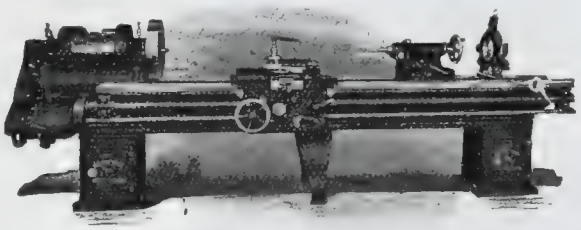


DOING IT'S BIT!

The hundreds of lathes that are doing service in the factories of Canada have rightly been called "the machines behind the men behind the guns."

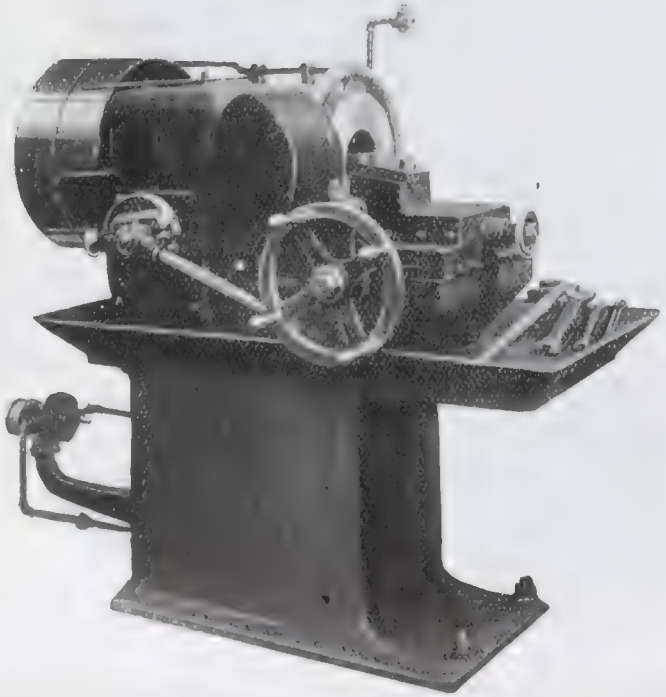
They are doing their bit to win the war. SIDNEY'S have won their spurs in the past three years! They have become one of the leaders among good lathes. Special attention is given in manufacturing to produce a lathe that will prove as steady as a rock under severe conditions. Write to the nearest agent and get Bulletin 30.



FOSS & HILL MACHINERY CO.,
MONTREAL, QUEBEC
H. W. PETRIE, LIMITED
TORONTO, ONTARIO

THE SIDNEY TOOL CO.,
SIDNEY, OHIO, U.S.A.

6″ Light
Base Facing
Machine



Another Worthy Victoria Product

THIS machine has proved itself a first-class investment.

Well-Designed
Carefully Built
Sturdy and Efficient

IT is a conclusive argument in favor of special purpose machines.

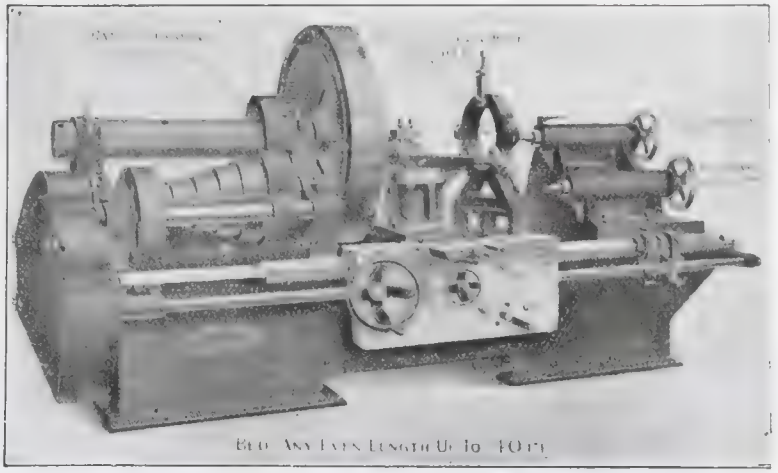
Space required 4x7 feet.
No countershaft required.
Approximate weight, 2000 lbs.

Victoria Foundry Company Limited
OTTAWA - - ONTARIO

One Ship-building Plant

wrote to six different Lathe-Builders

and bought McCabe's "2-in-1" Double-spindle Lathe—on a 30-ft. bed—because it was "different" and built especially for such a wide range of work.



McCABE'S "2-in-1" Double-Spindle Lathe 26-48 inch Swing
As a 48 inch Triple-Geared Lathe

What other big Lathe can you get, and have full use of your Lathe, whether you have big or small work?

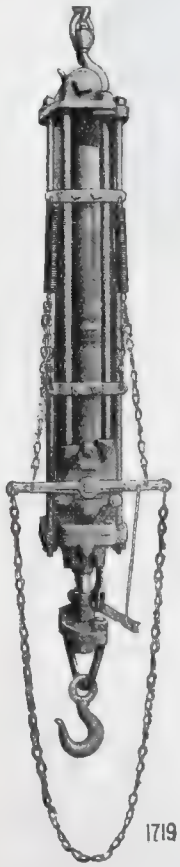
What Lathe Manufacturers except McCabe could make such a low price possible?

No other Lathe builder turns out 48-inch Lathes in such big lots at a time, making the parts all duplicate and interchangeable.

And in addition to the 48-inch Triple-geared Lathe, the 26-inch is the "Lathe plus" feature McCabe offers you—at no extra cost.

DOUBLE service—convenience and capacity—all described in Latest Bulletins

J. J. McCABE, 149 BROADWAY, NEW YORK



WHITING AIR HOISTS

Most convenient for the many quick, short lifts about the average shop.

Valve stem does not pass through air chambers and therefore no packings are required.

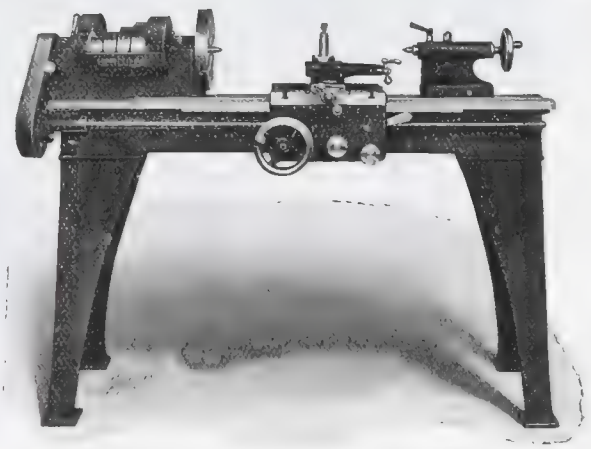
Automatic cut-off guards against waste of air.

All details the result of many years' study in manufacturing and operating cranes and hoists of all kinds.

Send for catalog 119

Complete Foundry Equipment. Cranes of all Types.

WHITING FOUNDRY EQUIPMENT CO. HARVEY-ILL. U.S.A. CHICAGO SUBURB.



LATHES

12", 16", 18" and 21" swing

Strictly modern in design, rigidity and accuracy guaranteed.

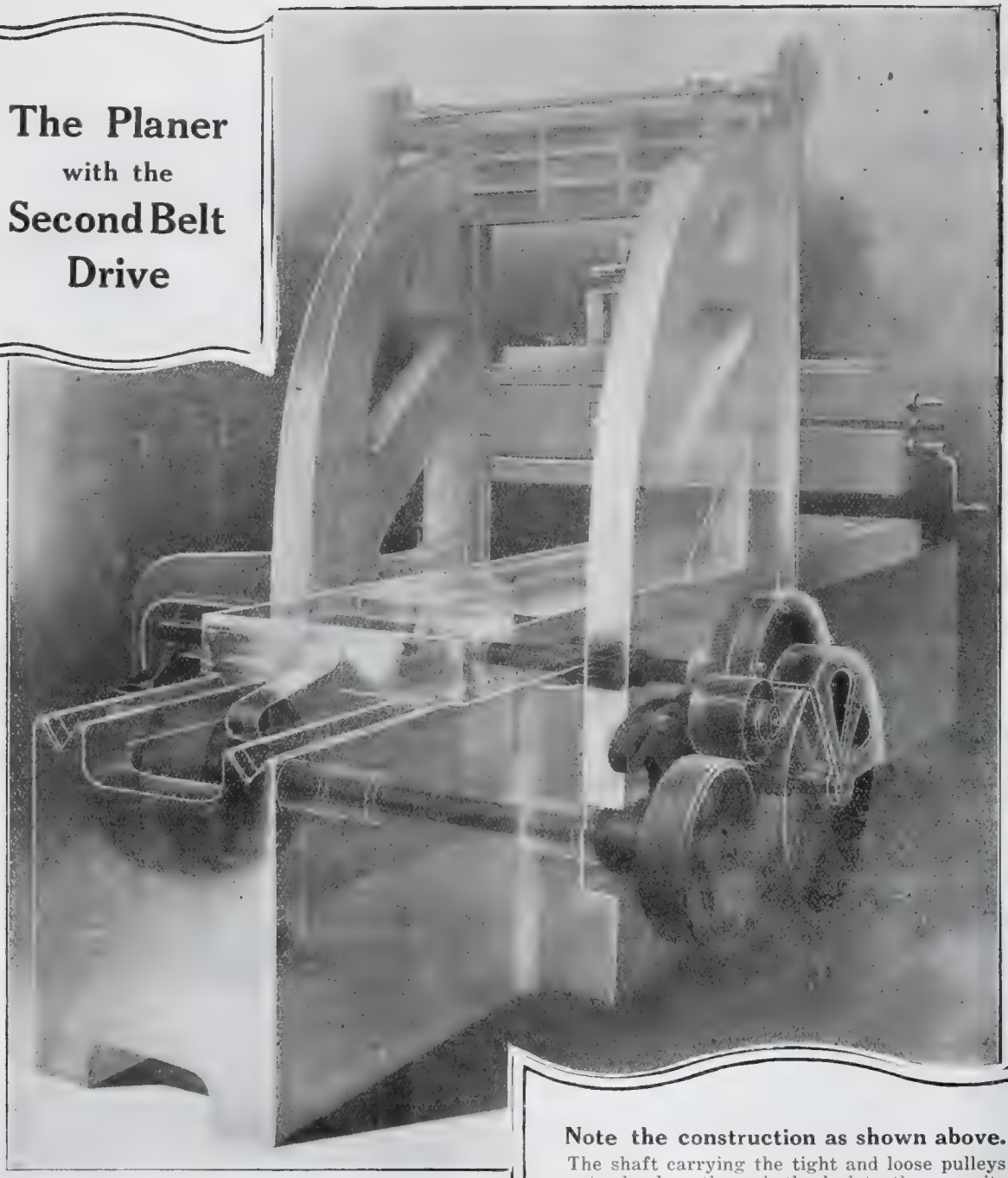
Himoff Machine Company

45 Mills Street

Astoria, City of New York, N.Y.

If any advertisement interests you, tear it out now and place with letters to be answered.

The Planer with the Second Belt Drive



Whitcomb-Blaisdell Planers

Note the construction as shown above.

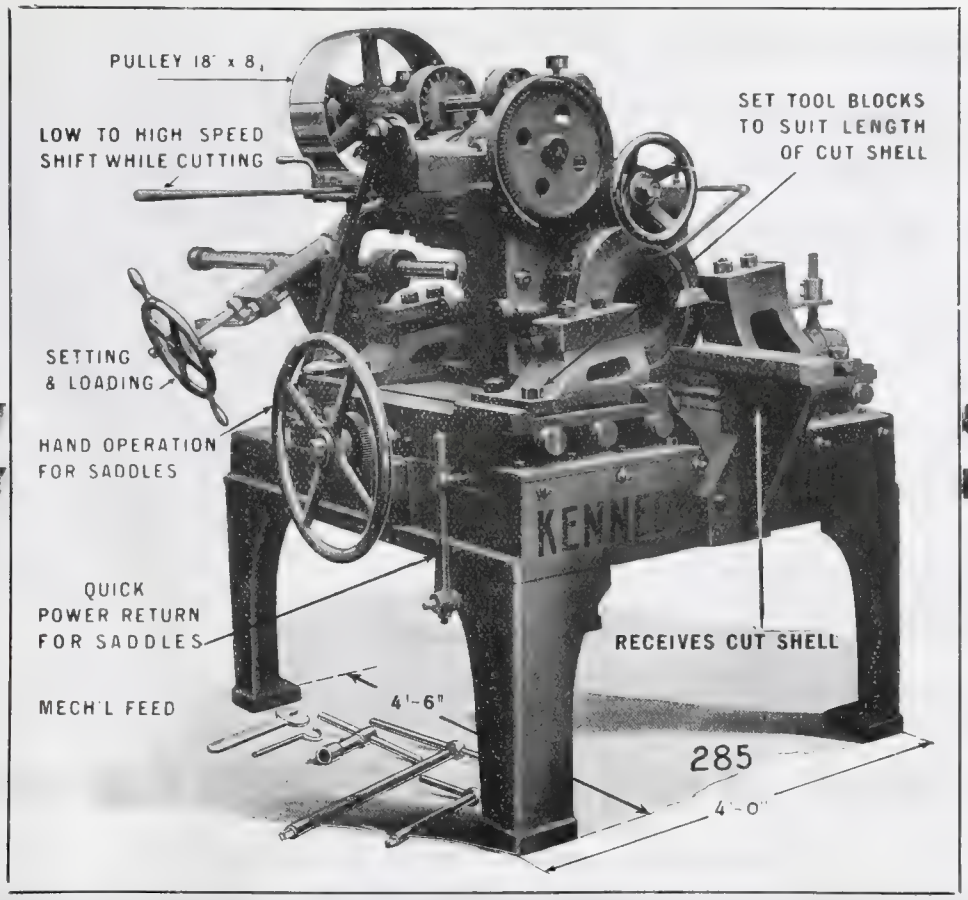
The shaft carrying the tight and loose pulleys extends clear through the bed to the opposite side of planer. Mounted on the shaft is a small pulley, known as the second belt pulley. From this pulley an endless belt, kept taut by an adjustable idler, conveys the power to the larger pulley, which carries a spiral pinion. This spiral meshes with a gear on the end of driving pinion shaft, which contains in itself the pinion driving the table.

Thus the usual bull-wheel, and the noisy, inefficient gear train, are eliminated.

The smooth, easy action obtained by this belt drive allows the use of high cutting and return speeds.

Whitcomb Blaisdell Planers have many distinctive features for rapid, accurate production. Write for the Illustrated Catalog that tells ALL about them.

Whitcomb-Blaisdell Machine Tool Co.
WORCESTER, MASS., U.S.A.



6-inch Shell Cutting-off Machine

Cuts both ends at once

Forgings load in one end and discharge out the other end when cut

A Girl can operate it.

New quick power return for saddles

DELIVERIES REASONABLE

Wm. Kennedy & Sons, Limited

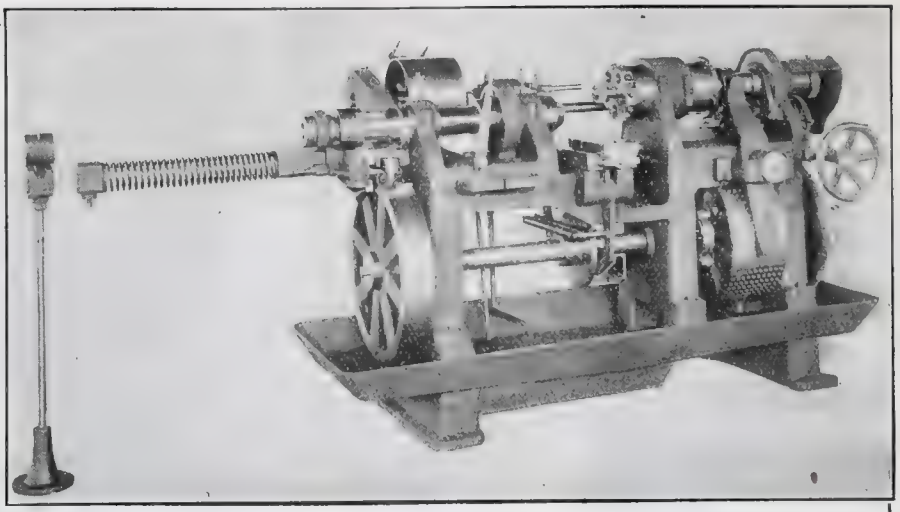
Owen Sound, Ontario

If any advertisement interests you, tear it out now and place with letters to be answered.

The Chicago Automatic Screw Machine

TEN YEARS OF EXTENSIVE MANUFACTURE OF ONE PRODUCT — AUTOMATICS — STAND BEHIND EVERY MACHINE.

No complicated mechanism or a system of cams that are difficult to determine and arrange on this machine.



The rigidity of the machine has not been sacrificed for the flexible features which are embodied in the Chicago Automatic. Alignment is correct and there are no parts where excessive wear takes place—therefore, accurate production is assured during the long life of the machine.

Spindle speeds suitable to different sizes and kinds of stock within the capacity of the machine are obtained by changing two gears on the spindle head.

In less than six weeks we can place Chicagos in your plant ready for production.

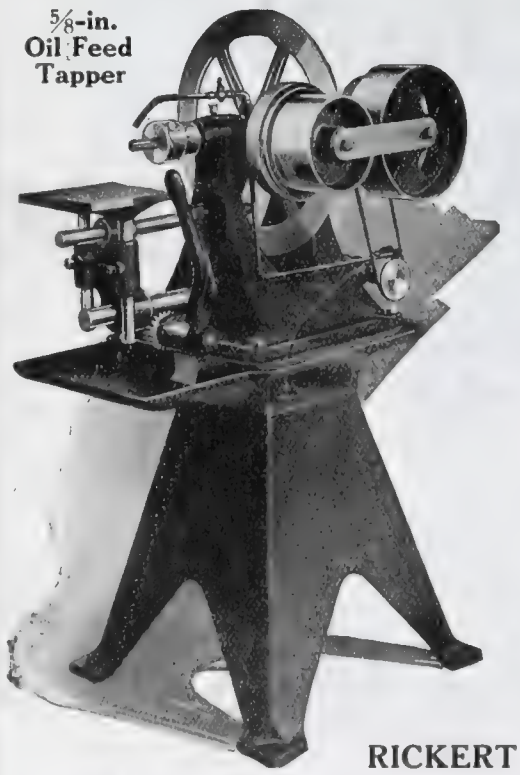
They must satisfy you before we consider them sold. Write us about all the features now.

THE JOHN MACNAB MACHINERY COMPANY

NEW YORK CITY, U.S.A.

European Representatives: John Macnab, Hyde, England

5/8-in. Oil Feed Tapper



This 5/8" Oil Feed Tapper is featured by the continuous oil feed, which allows greater speed, increased efficiency and output, and longer life.

THE RELIABLE

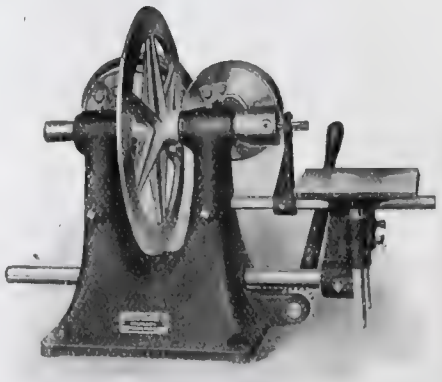
RICKERT-SHAFER TAPPERS

Speed, Accuracy and Minimum Breakage

These are outstanding results in shops that have installed R-S Tappers.

R-S range of Tappers permit of all kinds of work from 3-16" to 5/8". Made in bench, vertical and horizontal designs.

Pleased to tell you all about them. Write.



Bench Tapper

RICKERT - SHAFER COMPANY

ERIE, PA., U. S. A.

This is Our Address—How Can We Serve You?

ALFRED HERBERT, Foreign Agent.

COVENTRY, ENGLAND

DO YOU WANT TO SEE SOME LATHE?

The Heaviest and Most Powerful of its size made. Every line Symmetrical, every part Proportioned. Looks like a 30-inch; does as much work.

CISCO 24-INCH ENGINE LATHE

is ready for you now. It has the CISCO earmarks of simplicity in operation and of design. It is accurate and efficient. It is provided with many conveniences, shear wipers, double cabinet legs with shelves and doors opening oppositely; semi-enclosed head, in fact everything needed for a good lathe.

ASK WILLIAMS TO LET YOU KNOW ALL ABOUT IT

and if you want one soon, don't be too long in asking. Williams will also sell you a CISCO 14″, 16″ or 18″, tool room or engine.

THE CINCINNATI IRON AND STEEL COMPANY

CINCINNATI, U. S. A.

Makers of the "LATHE WITH THE PULL"

—THREAD CUTTING—

COLLAPSING TAPS AND SELF-OPENING DIES

NAMCO Self-Opening Dies are made in revolving and non-revolving types, for use on Automatic Screw Machines, Bolt or Stud Threaders, etc.

—Their open construction makes them practically self-cleaning.
—Adjustments are easily made by micrometer gauge.
—Chasers are correctly made and supported directly back of the cutting edge.

A NAMCO Die for every threading requirement.

NAMCO Taps have these distinctive features:—

Positive collapsing and resetting—with no damaged threads.

"No hole too deep"—cutting diameter is the largest diameter on the tap.

Simplicity of construction—less parts to adjust or wear out.

Sold on the basis of less cost per thread tapped.

Special catalog sent on request—specify "O-D" or "Tap," or both.

The **NATIONAL ACME COMPANY**

CLEVELAND, OHIO

NEW ENGLAND PLANT WINDSOR, VT. CANADIAN PLANT MONTREAL, P. Q.

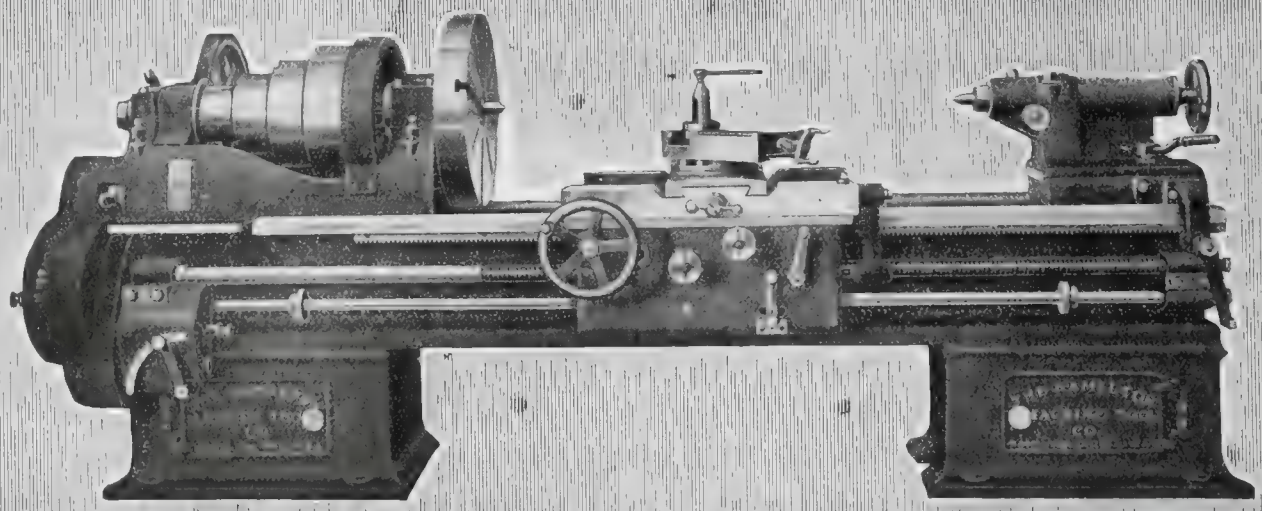
Branch Offices

NEW YORK BOSTON CHICAGO DETROIT ATLANTA SAN FRANCISCO

FOREIGN REPRESENTATIVES

Makers of Gridley Single and Multiple Spindle Automatics at Windsor, Vt., and Acme Automatics, Threading Dies and Screw Machine Products at Cleveland, Ohio.

If any advertisement interests you, tear it out now and place with letters to be answered.



Hamilton Lathes

Rapid Production HAMILTON Machine Tools

For 25 Years Makers of Fine Machine Tools

The "Hamilton" Line has a Reputation to Sustain.

THERE are two phases of production that require expert attention; those of *quality* and *quantity*. We have made a study of them for your benefit. The result is that we are able to offer you machine tools that give the highest efficiency and will still keep down the cost of production.

Illustrated here is one of our lathes. A close study on your part will partly reveal the care we have taken to give you a machine that is fitted to the needs of the day—greater production.

The "Hamilton Line" of machine tools is very complete and users are never tired of telling others of their features. A letter will command our immediate attention.

WRITE US TO-DAY.

The Hamilton Machine Tool Co.

HAMILTON *Sole Agents for Ontario:* OHIO, U.S.A.

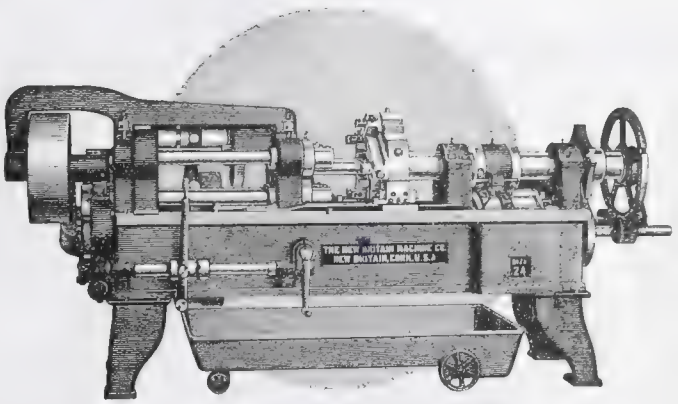
H. W. PETRIE. LIMITED, TORONTO, ONT.

NEW BRITAIN

WHETHER it's a bar job or chucked work there's a "NEW BRITAIN" that will handle it with utmost accuracy and *unequalled* efficiency.

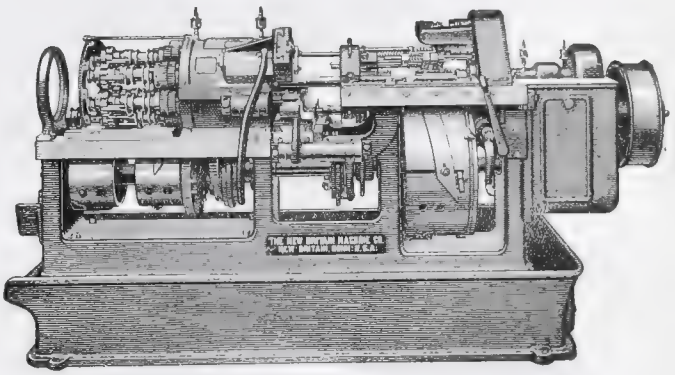
SINGLE-HEAD MULTIPLE-SPINDLE AUTOMATIC CHUCKING MACHINE

Designed for chucking castings, forgings and second-operation screw machine work. All operations are performed simultaneously, a finished piece being produced in the interval of a *single operation*—often a half or a third of that, by dividing a long cut between two or three similar tools.



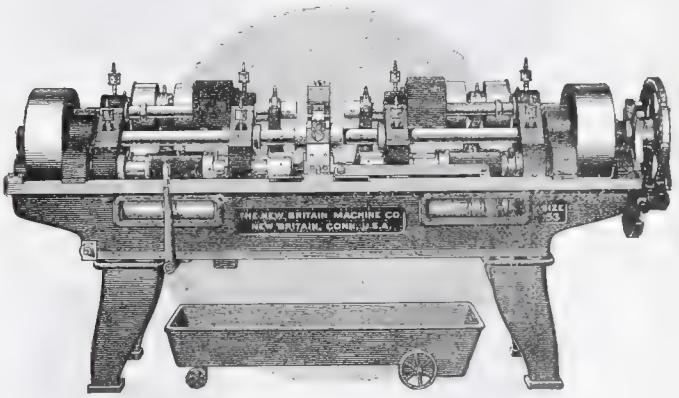
SIX-SPINDLE AUTOMATIC SCREW MACHINE

Its greater tooling capacity enables it to *finish complete* on the bar such work as is commonly rehandled when produced by machines of older type. On the ordinary run of bar work, not requiring the number of *different* tools for which the "New Britain" has capacity, production is greatly increased by subdividing the longer operations between two or three *similar* tools. On simple work the six-spindle machine will produce *two or three pieces* at each indexing, cutting off in two or three positions.



DOUBLE-HEAD MULTIPLE-SPINDLE AUTOMATIC CHUCKING MACHINE

This machine is similar to the one at the top, except that it is designed to handle work which permits of machining on *both ends at once.* Its production is thus double that possible in the single-head type. It may be adapted for handling simple "single-head" work, thus finishing *two pieces* at an indexing.



"New Britain" productions range from 50% to 500% above those obtainable on other machines designed for bar and chuck work. Let us submit estimates on your work. Send samples or blueprints.

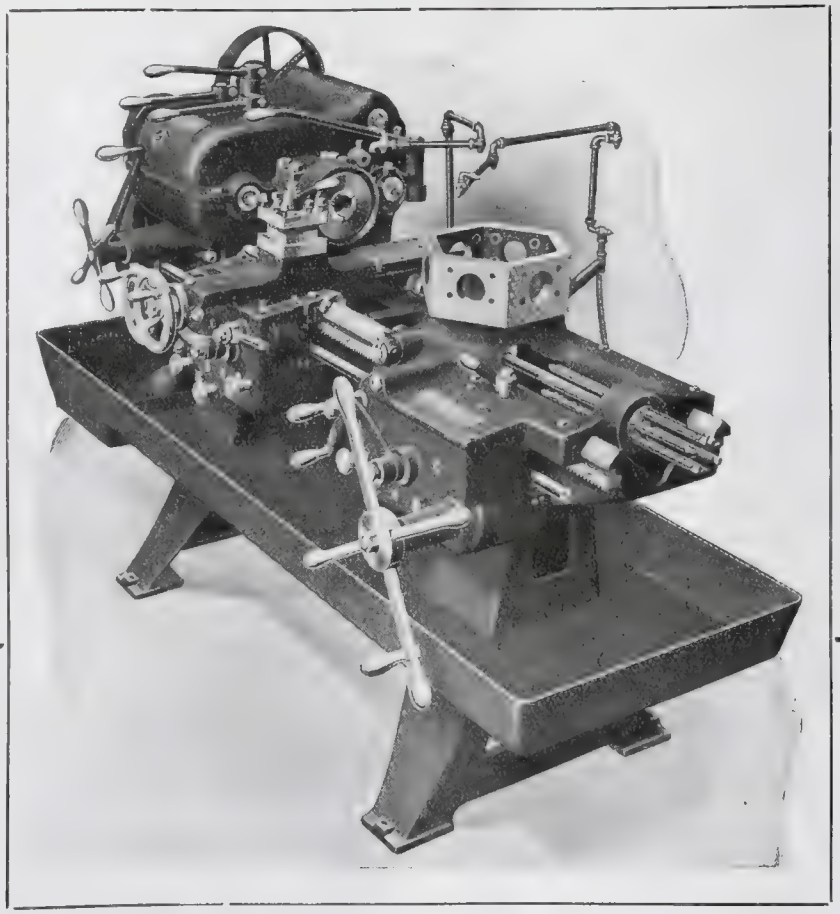
The

New Britain Machine Co.

New Britain, Conn., U.S.A.

AUTOMATICS

If any advertisement interests you, tear it out now and place with letters to be answered.



No. 138
Single Cutter Turner

No. 139
Multiple Cutter Turner

Bar Equipment

These are only four of the many standard tools that substantiate the claim of the designer that the 1-B Universal Turret Lathe is the biggest producer of bar work of its class and size.

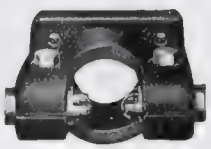
Note the rigidity of the Single Cutter Turner, and in connection herewith consider the effect of rigidity on production, also the time-saving effected by the graduated dial in setting the tool.

The Multiple Cutter Turner is the big time-saver on lighter work. As shown in the cut, it can carry four cutters and a drill for simultaneous operation, but on special order it can be equipped to carry six cutters and a drill, making seven cutting tools in all.

THE COMBINATION OF FOSTER MACHINE AND FOSTER TOOLS—MAXIMUM PRODUCTION.

Please note, however, that this applies to all of the general machines built by

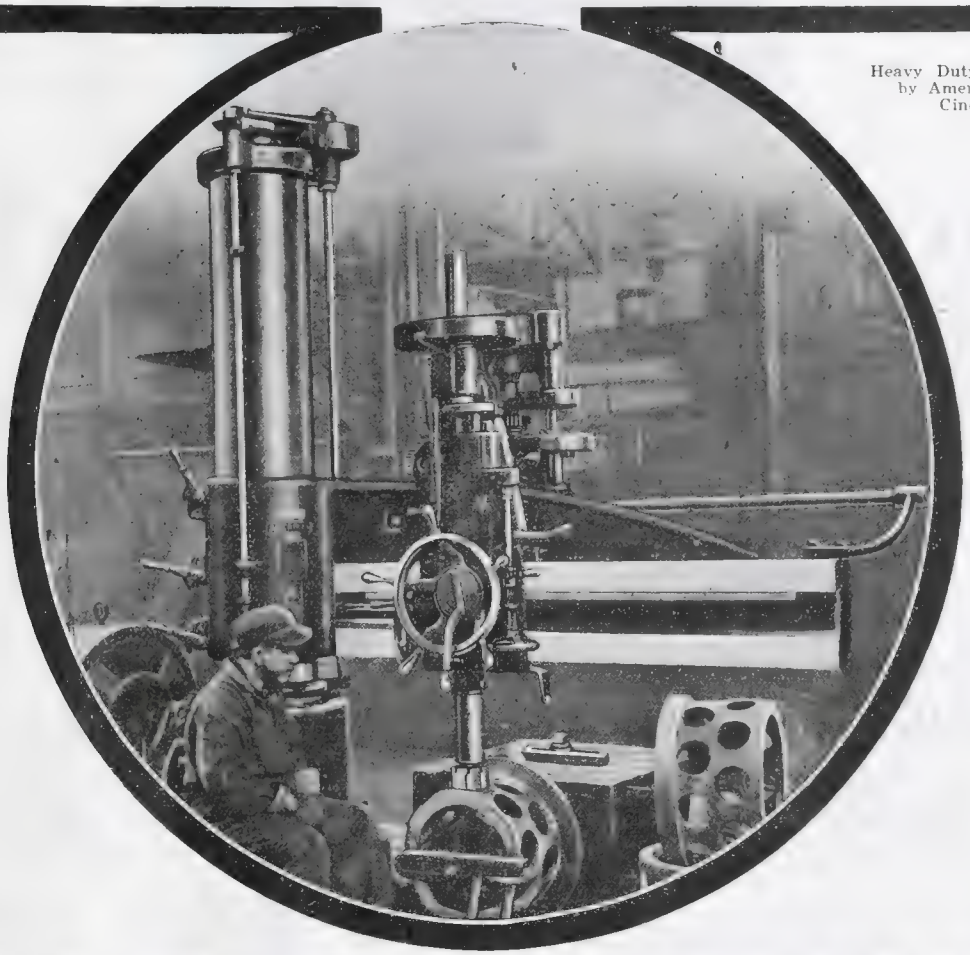
No. 149
Rear Forming Tool Holder



No. 143
Knurling Tool

FOSTER MACHINE COMPANY
Elkhart, Indiana

SKF



Heavy Duty Radial Drill made by American Tool Works, Cincinnati, Ohio.

BALL BEARINGS

No. 1 of a Series of SKF Equipped Drilling Machines

CAPACITY

The capacity for overloads—heavy, sustained; the capacity for big cuts; fast feeds; the capacity that gives you every ounce of twist at the drill point—that is the capacity made possible by S K F Ball Bearings.

This big American has capacity, because it is S K F equipped. How about **your** radial? S K F Ball Bearings will improve it. S K F service is at your disposal. Write our engineers to-day.

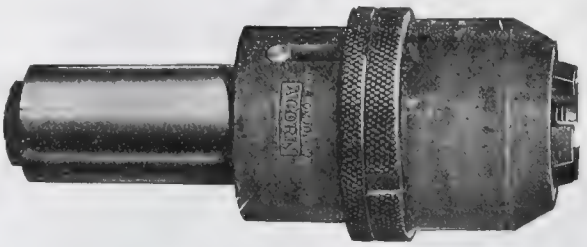
Canadian SKF Company, Limited

Toronto Ontario Canada

If interested, tear out this page and keep with letters to be answered.

ECONOMICAL SCREW THREADS

—The producing of them is the problem of thousands of manufacturers. We took a long step toward the solving of the problem in producing the



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It has so many advantages over the old style spring die and various other forms of dies and holders for machine use that it is difficult to enumerate them all.

A demonstration of the Acorn Die and Holder on your own work and on one of your own machines will give you a new standard for economy in screw threads.

WELLS BROTHERS COMPANY OF CANADA, Limited

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SALES AGENTS: The Canadian Fairbanks-Morse Company, Limited, Montreal, Toronto, Vancouver, Winnipeg, St. John, Calgary

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We have a great tradition to perpetuate. The British-made file has always been the standard of file efficiency. It has always had better steel in it, quicker cutting teeth, and been harder and straighter than the files of other nations. That is unchallenged the world over.

Founded on an ideal—the production of Canada's Finest Files—this corporation is entirely Canadian, therefore all-British, and our whole organization is saturated with the maxim—

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TRADE MARK

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Made in Canada, by Canadians, for Canadians.

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PORT HOPE FILE MFG. CO., LIMITED

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"Ask your jobber"

U. S. Electric Drills and Grinders

Save Time, Labor and Money

They can be attached to any lamp socket.

For drilling in metal they are superior to any other kind of portable drill. Cost 50% less to run than air drills.

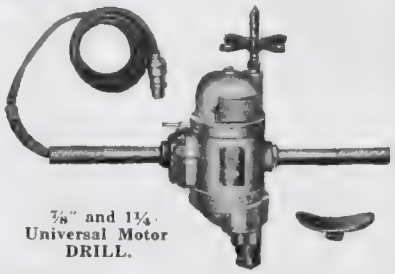
3 SIZES

3-16 in., W.G.T., 6 lbs.
¼ in., W.G.T. 9 lbs
⅜ in., W.G.T. 12 lbs.

All motors wound for 110 or 220 volts.

Direct or alternating current.

Try a few of our Electric Drills and Grinders and you'll send us an order for more. Our guarantee protects you.



⅜" and 1¼ Universal Motor DRILL.

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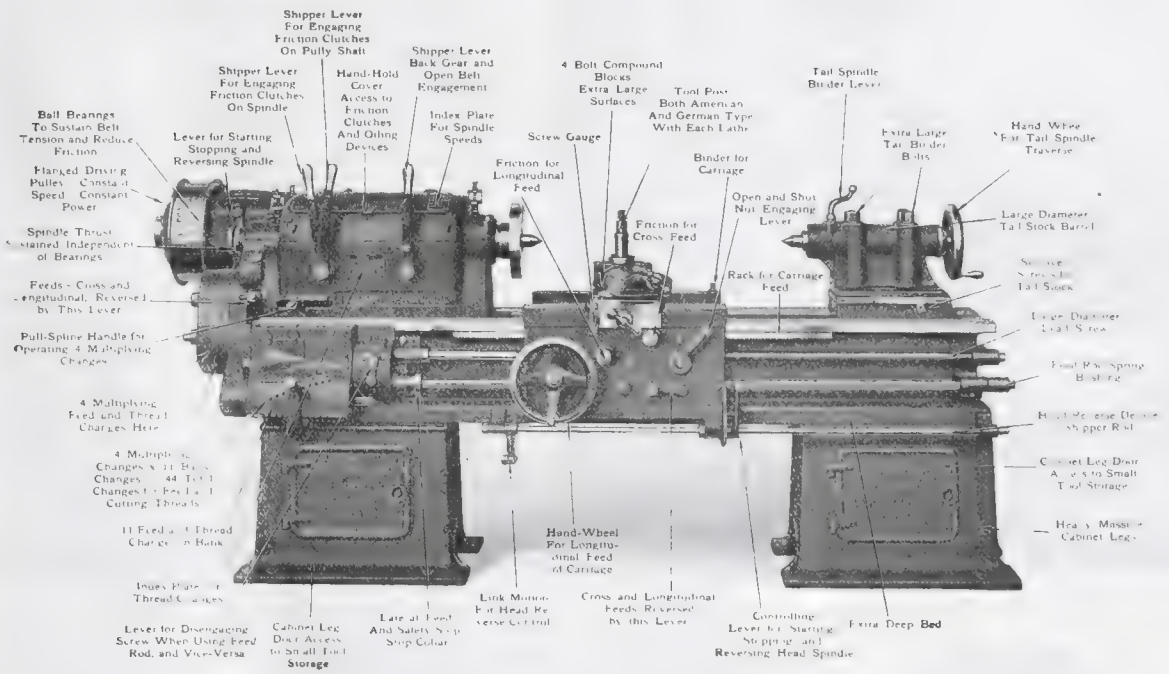
Shipper Lever For Engaging Friction Clutches On Pully Shaft
Shipper Lever For Engaging Friction Clutches On Spindle
Hand-Hold Cover Access to Friction Clutches And Oiling Devices
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4 Bolt Compound Blocks Extra Large Surfaces
Tool Post Both American And German Type With Each Lathe
Tail Spindle Binder Lever
Ball Bearings To Sustain Belt Tension and Reduce Friction
Lever for Starting Stopping and Reversing Spindle
Index Plate For Spindle Speeds
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Extra Large Tail Binder Bolts
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Flanged Driving Pulley Constant Speed Constant Power
Friction for Longitudinal Feed
Binder for Carriage
Open and Shut Nut Engaging Lever
Large Diameter Tail Stock Barrel
Spindle Thrust Sustained Independent of Bearings
Friction for Cross Feed
Rack for Carriage Feed
Feeds - Cross and Longitudinal, Reversed by This Lever
Pull-Spline Handle for Operating 4 Multiplying Changes
4 Multiplying Feed and Thread Changes Here
Hand-Wheel For Longitudinal Feed of Carriage
Index Plate for Thread Changes
Link Motion For Head Reverse Control
Cross and Longitudinal Feeds Reversed by this Lever
Controlling Lever for Starting Stopping and Reversing Head Spindle
Extra Deep Bed
Lever for Disengaging Screw When Using Feed Rod, and Vice-Versa
Cabinet Leg Door Access to Small Tool Storage
Lathe Feed And Safety Stop Stop Collar

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YOUR BATTLE IS THE STRUGGLE FOR PRODUCTION AND PROFITS.

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Grinding Planer Tools With Alundum Wheels

The wheel on the machine shown is a 24-inch Vitrified Alundum, grain 30, grade O, running at a speed of 900 r.p.m. The wheel is in actual operation grinding tools 90 per cent. of the time, and under this service wheels are lasting 4 to 5 months. Equally good results are being made on other grinding operations.

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ELECTRIC FURNACE PLANTS:
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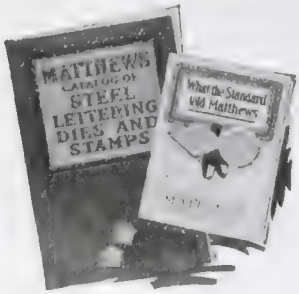
Matthews stamps are extensively used for marking shells. Many Canadian munitions plants have complete Matthews equipment, including holders, type, separate stamps, inspectors' hammers, etc.

Catalog gives complete description of our extensive line, send for a copy.



Special "Champion" holder with type chamber curved radially for marking base of shells.

Special "Champion" holders with type chamber curved on face for marking sides of shells.

JAS. H. MATTHEWS & COMPANY

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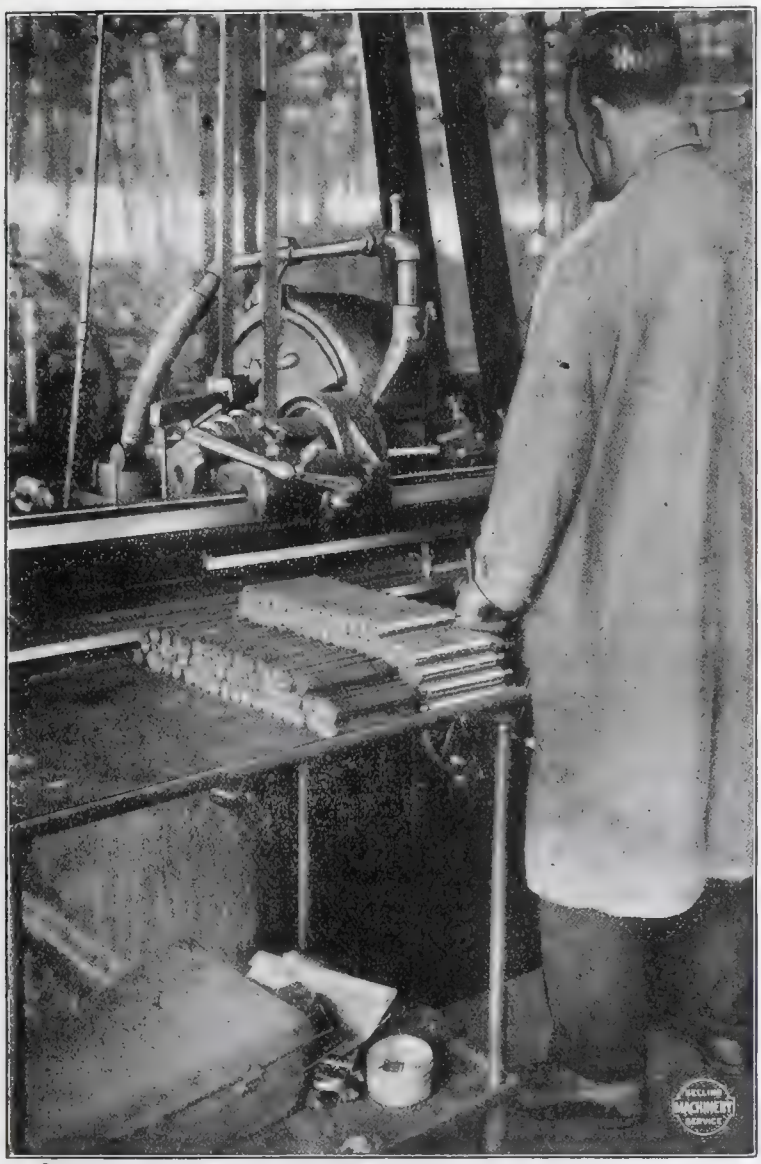

Another Good Example of NORTON "Wide Wheel" Grinding on Automobile Parts

Fast time on automobile parts grinding is being made by the Morrow Mfg. Co., (Elmira, N. Y.) where wheels 6″ wide are used and the entire cut taken by feeding the wheel directly into the work. The two pieces shown below are typical of this work.

NORTON GRINDING COMPANY

WORCESTER .·. MASS.

Selling Agents for Canada:
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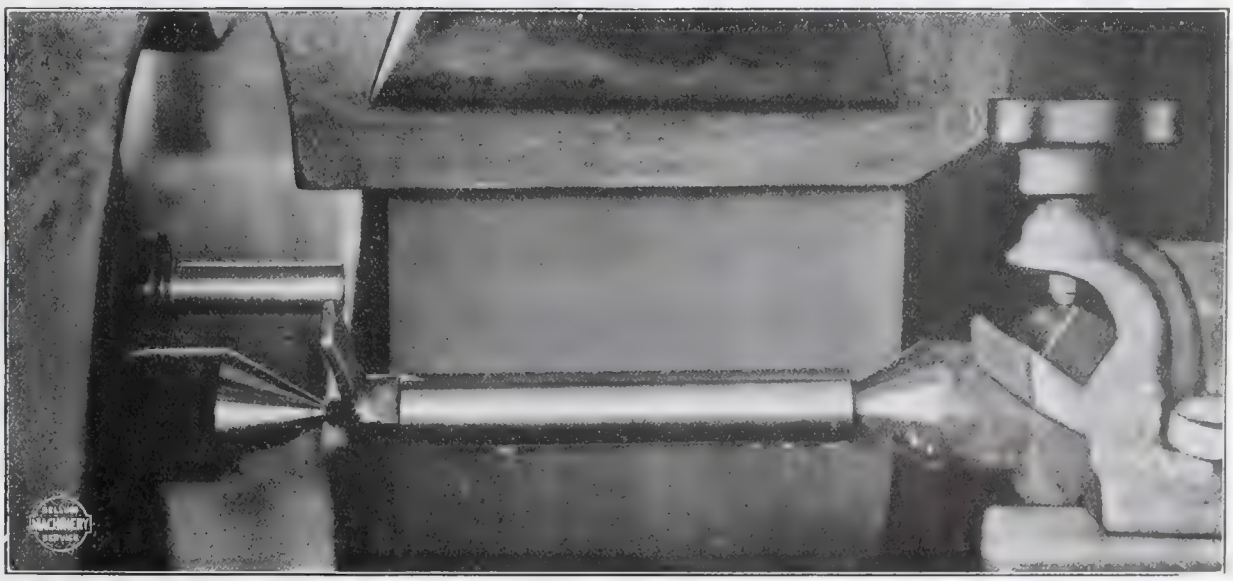

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COMPLETE EQUIPMENT FOR THE POWER HOUSE

Boilers	Shovels	Oil Filters	Tools of all kinds
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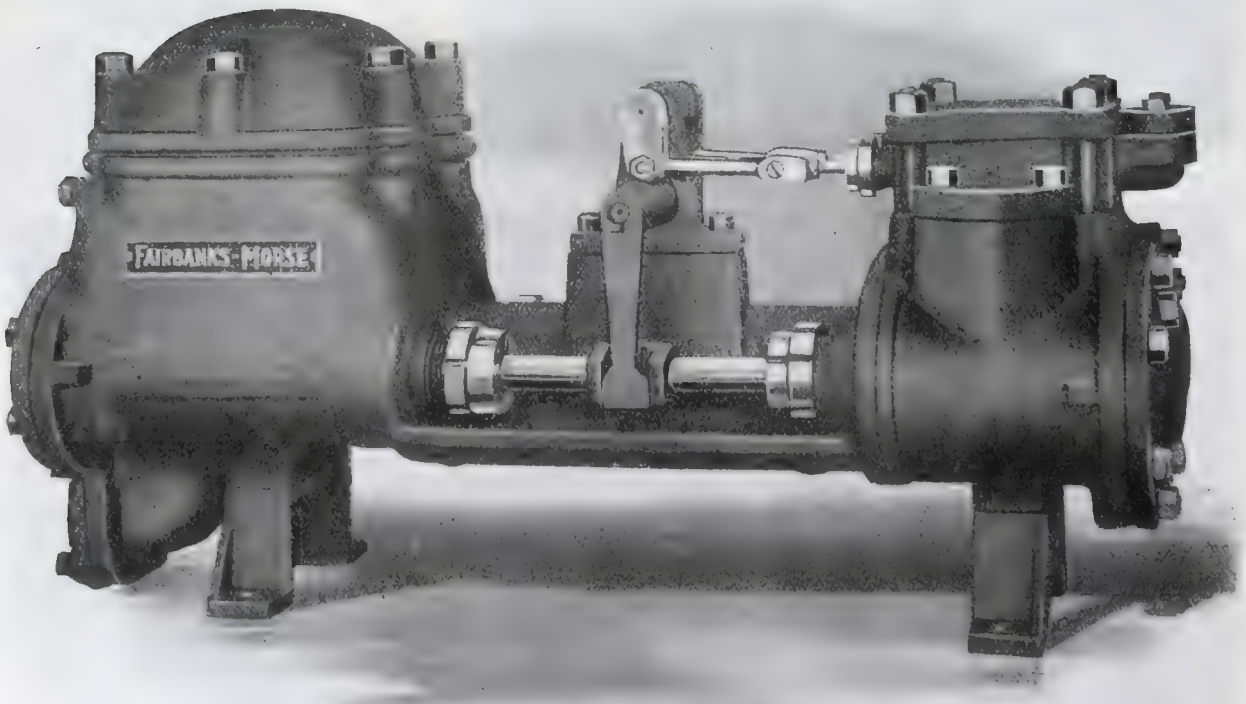


12 in. x 26 in. x 16 in. Compound Expansion Marine Engine

Staff Article

While the real extent to which Canadian shops are assisting in defeating the enemy on sea will perhaps never be known, the manner in which help is being rendered is familiar to most of our readers. The engines described herewith are purely a war-time product so far as design and material are concerned, but the fact that experience in the production of such items is being obtained on a wide scale is a factor of considerable importance at this time.

WITH the possible exception of the munitions activity of two years ago no other industry has made such rapid and remarkable advancement as that of shipbuilding. The developments in this direction have undoubtedly been hampered to a large degree by prevailing conditions, owing to the difficulty of obtaining labor and material. The labor problem is at present however, much relieved as a result of curtailment in the manufacture of shells, but the inability of securing plates for the construction of steel vessels, continues to be a deterring factor in the laying down of this type of boat. Irrespective however, of the class of hull, it is essential that power facilities be installed for the efficient operation of modern cargo vessels.

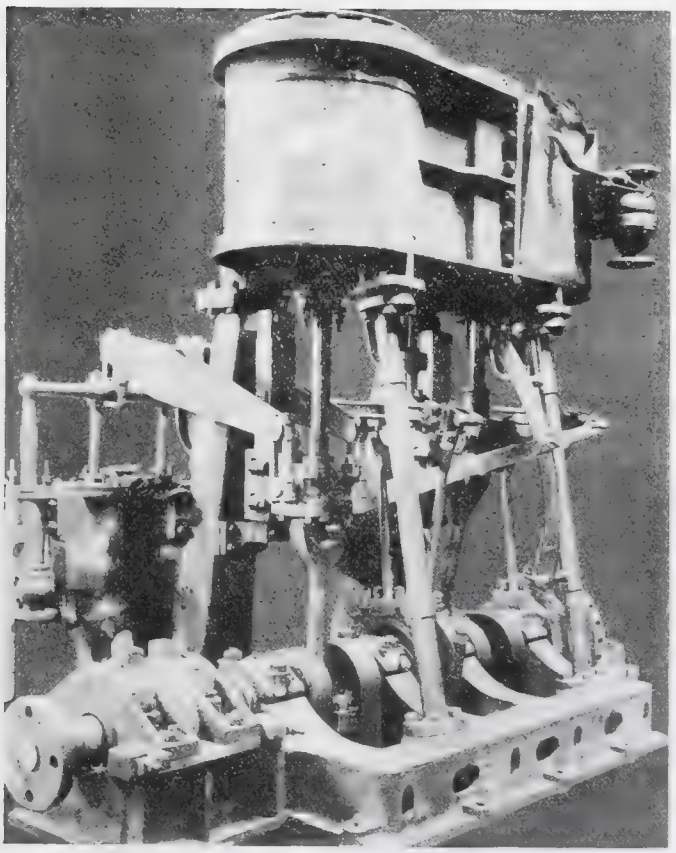
The accompanying cuts illustrate the design of a compound marine engine being constructed by various Canadian firms. The boats for which these engines are intended are 85 ft. long, 19 ft. 3 in. beam with a draft of about 11 ft., and will be used for ocean service. The boilers are of the Scotch multitubular marine type, 9 ft. 6 in. dia. by 9 ft. long, having two plain furnaces with separate combustion chambers. They are to have a working pressure of 140 lbs. per sq. in.; and before leaving the works were given a cold water test at double the working steam pressure and afterwards subjected to a steam test to meet the requirements of Canadian Government inspection.

Frame and Cylinders

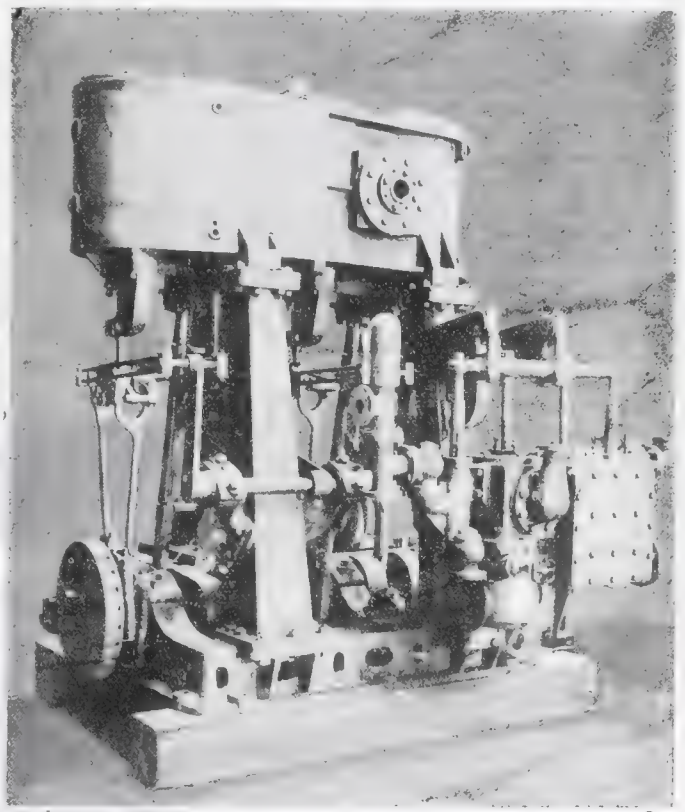
The bed plate of the engine is of heavy ribbed cast iron with flat bottom, having a depth of over 12 in. below the bearings. The main journal boxes are fitted with dovetailed sections of white metal that are well hammered into place, the bearings being so designed that the bolts that hold the caps can be freely removed after engine has been placed in position. Liners and distance pieces are provided, the liners being the same thickness as the babbitt metal and the distance pieces being equal to 1-7 the diameter of the bearing. The framing that supports the cylinders consists of cast iron columns at the back, the front columns being of forged steel, securely fitted to the bed plate and seatings of the cylinders. The cross head guides are of the hollow rectangular type for water circulation.

The cylinders are of hard close grained cast iron having a minimum thickness of 1⅛ in. The high pressure cylinder has a diameter of 12 in. and the low pressure cylinder 26 in., with a stroke of 16 in. The H. P. cylinder is fitted with a piston valve, the L. P. having a double ported slide valve. Facilities are provided for observing the setting of the valves without removing the covers. Cylinder covers are provided with eyebolts for hoisting and also suitable set screws for starting the joints. All covers are secured with steel bolts and fastened with case-hardened wrought nuts.

The pistons are of cast iron fitted with especially hard cast iron rings, the followers being secured in position by steel studs screwed into the pistons, bodies of the studs of the collar type and fitted into square holes in the followers. The piston rods are machine steel forgings, the ends being taper fitted into the piston and the cross head. The cylindrical portions of both piston rods are accurately ground to dimensions and highly polished. The stuffing boxes for piston rods



VIEW OF OPERATING SIDE OF 12"x 26 x 12 IN. COMPOUND MARINE ENGINE. THRUST BLOCK IN LEFT FOREGROUND



REVERSE SIDE OF ENGINE SHOWING BARRING WHEEL, VALVE GEAR, AIR, FEED, AND BILGE PUMPS

and valve stems are made of composition and fitted with metallic packing with ample lubricating facilities.

Operation of the Valves

The operation of the valves is obtained by means of the Stephenson link motion, the eccentrics being made of cast iron, while the straps are cast steel lined with white metal fitted into dove-tailed recesses and well hammered into place. The eccentrics are carefully fitted, by scraping, both on the face and rabbits, and channelled with oil grooves. The eccentric rods are made of high grade machinery steel forgings and fitted to the straps with collar stud bolts. The upper ends are fitted with adjustable brasses with the necessary gibs, set screws, etc.

All pins for the eccentric rods are forged on and accurately finished. The links of the double bar type, are so designed that when operating in forward position the passage way is not obstructed. The valve stems are connected to the link blocks with composition boxes, marine end type. Machinery steel link blocks are used with the jaws spanning the bars of the links; the jaws are fitted with composition gibs finished to the curve of the links and fitted with adjusting screws, the lower gibs having screws with lock nuts. Suspension bars are attached to the links at such a position that motion between the link and the block is reduced to the minimum when engine is in the ahead position. The reversing shaft is of steel with arms and pins for connection to the suspension bars forged to the shaft.

Crossheads and Connecting Rods

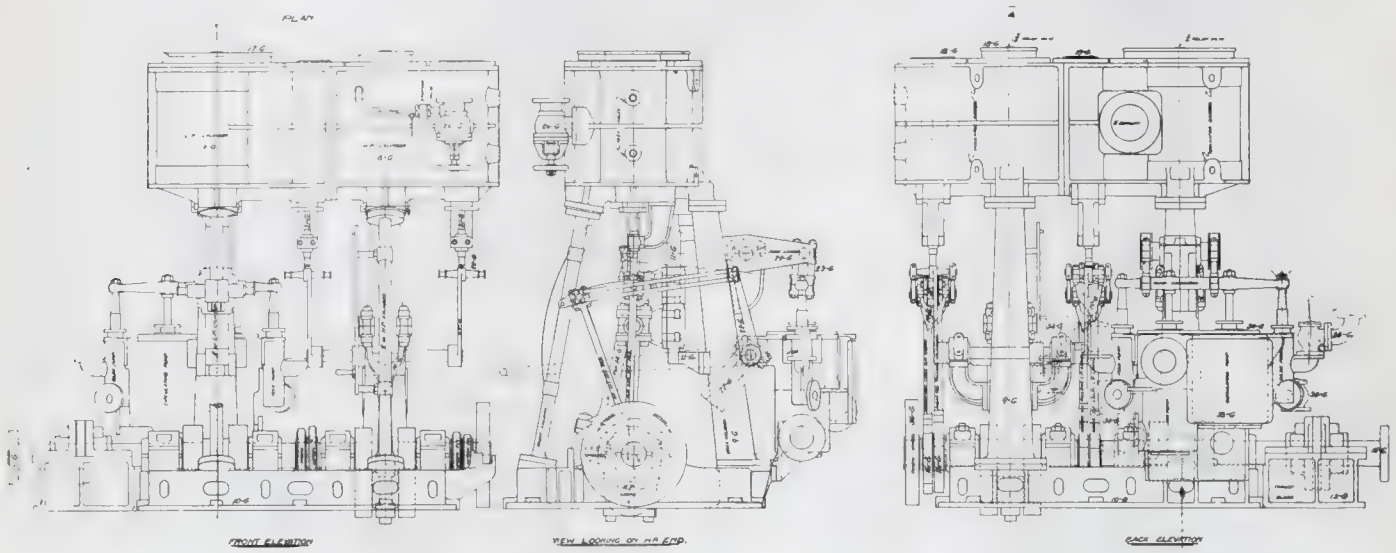
The crossheads are of high grade machinery steel with the journals forged on; the gibs for the slippers are lined with approved anti-friction metal both on the ahead and astern sides, cast and peened in place. The gibs are provided with lips at the top and bottom, liners being furnished for adjustment when taking up the wear. The slippers are designed with sufficient area so that the pressure on the anti-friction bearings will not exceed 40 lbs. per sq. in. and are amply supplied with oiling facilities.

The connecting rods of machinery steel are 40 in. long between centers, forked to span the crossheads and finished all over. The bearing boxes at either end are of composition and secured by forged steel bolts, the crank end being fitted with sections of white metal.

Crank Shaft

The crank shaft main journals are 5½ in. dia., with crank pins of a similar diameter and 6½ in. long, enlarged in the webs. The crank webs are of ample size with raised seatings for eccentrics forged on; the holes in all the couplings are drilled and reamed, and the bolts snugly fitted with a parallel body and the nuts locked with suitable split pins. The two cranks are set at an angle of 90 degrees with each other.

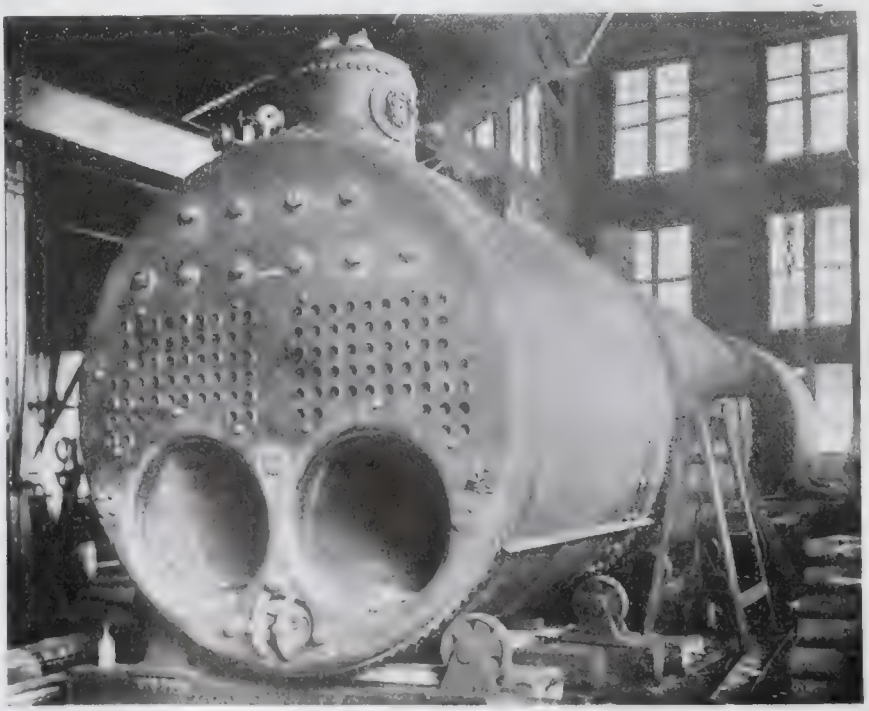
The thrust shaft is made of high grade machinery steel and has six thrust collars. The bearings are of the horse shoe type with four or more of the shoes fitted with anti-friction metal on both sides, and provided with suitable adjustment and also ample oiling facilities and water circulation for each shoe. There is also fitted at either end bronze stuffing boxes to prevent the escape of the lubricating oil. These bearings are designed to withstand a thrust of not more than 45 lbs. per sq. in.



ELEVATIONS OF 12 X 26 X 16 IN. COMPOUND EXPAN SION MARINE ENGINE FOR CANADIAN-BUILT HULLS.

Accessory Equipment

Independent surface condensers are provided, having tubes of seamless drawn



SCOTCH MARINE TYPE BOILER 9 FT. 6 IN. X 9 FT. FOR 140 LBS. WORKING PRESSURE.

brass No. 18 B. W. G. secured to the tube sheets with screw ferrules and packing, the tube sheets being amply stayed with through bolts. The condenser heads are removable without disturbing any of the piping connections. The cooling surface on the exterior of the tubes having a total area of over 400 square feet and before leaving the works the condensers are tested under a pressure of 20 lbs. to insure the soundness of the joints.

Directly mounted on the main engine and operated by levers connected to the L. P. piston rod, is the air pump, feed pump, and bilge pump; also a general service pump, Blake type. Other auxiliary equipment consists of a cast iron centrifugal circulating pump, brass fitted, direct connected to a vertical slide valve engine. The tail shaft is fitted with brass sleeves, and the end tapered to suit the propeller of cast iron four blade type. The tail shaft operates through a cast iron bearing lined with lignum vitae.

All bearings throughout are amply provided with efficient oiling facilities and the piping is sufficiently large to insure a regular supply of lubrication at all times. Wherever possible sight feeds have been provided for the convenience of the operators. The water circulation to the various surfaces requiring cooling is passed through brass piping. Before being shipped these engines are given a test under steam and must comply with various official requirements.

FIRST BRITISH STANDARDIZED SHIP PASSES TESTS

ACCORDING to recent advices, the first of the standardized ships built to the order of the British Government has completed her final tests and been put into commission as a cargo carrier for the nation. In every respect the trial proved an unqualified success. It was of a most exhaustive and comprehensive nature, and the experts who were on board during the inaugural trip were unanimous in their praise of the vessel, which marks a new epoch in the maritime history of the Empire, and which may be destined to play an important part in the campaign against enemy submarines.

Objects of Type

The standardized ship has been designed with the idea of providing a good type of cargo carrier in the shortest possible time, with the minimum expenditure of material, having regard to war conditions, which involves the question of the speed of the ship. The keel was laid in February this year, and in August —less than the full six months—the vessel was fully loaded and ready to go to sea. She is the first of the series of standardized ships, but actually there are two types of vessels, of 8,000 tons deadweight carrying capacity. These are classified "A" and "B" types, the first-named being single-deck ships and the others two-deck ships. This ship is of the "A" class. It is also intended to construct two smaller types—one known as class "C"—and these ships will be 5,000 tons deadweight each; and class "D," all of which will be 3,000 tons deadweight. In addition, however, other types are under consideration at present.

All the principal shipbuilders in the United Kingdom are busily engaged on the construction of standardized ships, and, while the number on hand need not be stated, the total output will be very substantial. The vessels are being constructed under the supervision of the classification societies—Lloyd's Register, British Corporation and the Bureau Veritas—all of which are really collaborating for this purpose. As in the case of the hull, the machinery and engines are all standardized, so that the first engine goes into the hull complete. This is an obvious advantage of the first order, as not infrequently it has been the experience of builders to wait some considerable time for the installation of the machinery. Engines and machinery, of course, lend themselves more readily to standardization than the ship itself, as variations occur in the construction of the vessel owing to the different facilities in the respective yards.

Economy and Comfort

On the question of speed it may be added that special attention has been devoted to this important aspect with a view to securing the maximum number of knots for the service in which the vessel is intended to trade. A feature of the general arrangements and equipment is provided in the very large hatchways, making the ship almost practically self-trimming, and immensely facilitating the loading and discharging of the ship. In fact, the central idea is that such steamers should be not only built quickly, but capable of being worked speedily. Thus the standardized ship represents a long advance on the way towards producing "a poor man's ship," as it can be run on the most economical lines, everything possible having been simplified. Admittedly, there are no "frillings" on the standardized ship. But the essential and paramount question of efficiency has not been overlooked. In the words of the experts, "it will be a very efficient cargo carrier," and there should not be the slightest difficulty in selling such vessels to any private owner after the war.

An important point—and one upon which there will be widespread interest —is that of the accommodation provided for the crew. This question, too, engaged the closest attention, with the result that it will be generally admitted that the provision made marks a big advance upon the men's quarters in ordinary cargo steamers, and particularly of the "tramp" class. The crew are berthed aft in the poop, instead of the forecastle, as has been the general rule hitherto, and separate cubicles are provided, each fitted with two berths. Messing arrangements are entirely separated from the sleeping accommodation; a smoke room is provided for general use, and special arrangements are made for steam-heating in the men's quarters.

OBSERVATIONS ON ROPE DRIVE PRACTICE

IT occurs to us that conditions and circumstances enter more largely into the determination of the various details constituting a rope drive than have to be accounted in that of a belt drive, therefore the following notes and observations on rope drive practice may be found interesting and useful:

Manila and cotton are the materials generally used for rope purposes, and may be constructed of 3 or 4 strands. The rope diameters in practice vary from 1 to 1¾ inches, although those below 1½ inches are somewhat uncommon. From investigation it has been computed that the safe and economical dorking strain for a 1 inch diameter rope is 200 pounds, with equivalent for other sizes. Rope wear is both internal and external, caused in the former by the movement of the fibres on each other, and in the latter by slippage and wedging in the pulley grooves. This wear, of course, is normal, and is dependent on the speed of drive.

As in belt drives the advantage lies with large diameter pulleys, the tendency being to less internal wear, due to fibre sliding decrease, with diameter increase. Care should be taken to have the grooves ground out smooth and of unbroken surface, so as to obviate unnecessary wear or tearing of the external surface of the rope. The groove angle may be 45 to 60 degrees. Rope wear is independent of pulley distance apart, because it takes place on the pulleys only; at the same time distance is a factor in first cost.

Experience goes to show that 80 feet per second is the speed at which the maximum horse-power is attainable; speeds beyond this having the horse-power output reduced by centrifugal tension. Cotton ropes require less lubrication than do Manila ropes.

RECENT ELECTRIC FURNACE ACHIEVEMENT

THE abnormal demand for munitions has, perhaps, done more than anything else could have done towards breaking down the prejudice against electric steel. Before the war had been in progress many months our armament makers found themselves accumulating enormous quantities of borings, turnings, screwings, etc., of very high grade steels, containing chrome, nickel, and other costly alloys. In ordinary times these turnings were of comparatively little value on account of the difficulty of remelting them without the loss of most of the alloys. But when the quantities of turnings produced in munition making became abnormal, it was at once realized that the best solution of the problem of utilization was afforded by the electric furnace, because it was capable of saving all the nickel and almost all the chrome, whilst remelting the scrap, besides which it could, if necessary, oxidize the chrome whilst retaining the nickel. Admittedly, no type of electric furnace was exactly perfect; but with a view to further perfection in the matter of treat-

ing these turnings, certain Sheffield metallurgists set to work in earnest to see what could be done to meet the new conditions. The result is the invention of a type of furnace for which the claim is made that something approaching perfection—certainly a very high level of efficiency—has been attained.

U. S. SHIPBUILDING PROGRAM

A CAREFULLY revised table showing the shipping facilities upon which the United States and its allies may depend during the next eighteen months or more to fight the German submarine was issued at Washington, D.C., on Sept. 26, by the United States Shipping Board.

Differing slightly from a statement earlier in the day by the Committee on Public Information, the table shows that the Government has under construction in dead-weight tonnage, including 400 vessels of foreign ownership which were requisitioned on the stocks, approximately 1,036 cargo vessels of 5,924,700 tons capacity. Most of these vessels will be completed by the end of 1918, and some of them will be off the stocks within sixty days.

These vessels have actually been contracted for. Congress, it was pointed out, also has before it a bill asking for funds with which to construct or purchase approximately 5,000,000 tons dead weight which will be completed in 1918 and 1919, raising the total of new construction under contract and the prospect to 10,924,700 tons dead weight. Reduced to gross tonnage this represents approximately 7,283,000 tons.

The statement issued by the Committee on Public Information showed that the Government now has in service for foreign trade 458 ships with an aggregate dead weight tonnage of 2,871,359 tons, not including 117 ships of German and Austrian origin totaling 700,285 tons, thus giving a grand total available for service to-day of 575 vessels of 3,571,644 dead weight tons. In June, 1914, the statement read: the available tonnage of the United States was only 1,614,222 tons.

The Shipping Board statement therefore shows as actually under construction or contemplated ships totaling 10,924,700 dead weight tons, or approximately 7,283,000 gross tons.

STEEL OUTPUT INCREASES

THE total production of steel ingots and direct castings in Canada in the first six months of the current year amounted to 836,149 short tons, an increase of 246,596 tons, or 42 per cent., over the corresponding period of 1916.

Average monthly production was 139,858, against 98,259 in the first half of 1916, and 106,268 tons for the full year, 1916. A new high record in output was reached in May, 155,346 tons, but the June figures show a falling off of about 18,000 tons.

The figures as compiled by the Mines Branch of the Department of Mines at Ottawa cover the entire output of the country, with the exception of two small plants.

Pig iron output, as estimated by the Mines Department from returns covering all producers, was 586,998 short tons, as against 562,097 in the first six months of 1916. The average monthly production was 97,833 tons, or only slightly higher than the average for the full year, 1916, which was 97,438 tons.

Imports from the United States have been on a considerably larger scale. The total imports of steel ingots and direct castings for the first six months of the year totalled 139,640 short tons, against 47,493 in the same period in 1916; in pig iron the increase was from 29,801 tons last year, to 38,858 tons this year.

Production figures in short tons by months this year are given as follows:

	Pig iron.	Steel Ingots, etc.
January	89,187	130,990
February	83,801	120,629
March	103,789	152,420
April	101,504	139,669
May	108,799	155,346
June	99,858	137,095

LARGE CHIMNEYS UNDER CONSTRUCTION

WHAT will be the largest chimneys in the world, when completed, are being constructed by the Alphons Custodis Chimney Construction Co. of New York. One of these chimneys, which is being built at Tacoma, Wash., for the Tacoma Smelting Co., has the following general dimensions.: Height above ground, 571 feet; inside diameter at top, 25 feet, and outside diameter at base, 50 feet 2 in. The other chimney, which is being constructed for the Anaconda Copper Co., Anaconda, Mont., will have the following dimensions: Height above ground, 525 feet; inside diameter at top, 60 feet, and outside diameter at base, 86 feet. The chimney at Tacoma when completed will be the tallest in the world, and that at Anaconda the largest in diameter.

The largest diameter chimney in existence at the present time was built in 1908 by the same concern for the Boston & Montana Copper Co., at Great Falls, Mont. It is 506 feet high and 50 feet inside diameter. These chimneys are built of special radial brick; some examples of this construction in Canada may be seen at the Toronto Carpet Mfg. Co., the Municipal Incinerator, Toronto, and the Goodyear Tire & Rubber Co. of Canada, Ltd., New Toronto, Ont.

WOOD FUEL VS. COAL

THE fuel value of two pounds of wood is roughly equivalent to that of 1 pound of coal. This is given as the result of certain calculations made in a Government forest service laboratory, which show also about how many cords of certain kinds of wood are required to obtain an amount of heat equal to that in a ton of coal.

Certain kinds of wood, such as hickory, oak, beech, birch, hard maple, ash, elm, locust, longleaf pine, and cherry, have fairly high heat values and only one cord of seasoned wood of these species is required to equal one ton of good coal. It takes a cord and a half of shortleaf pine, hemlock, red gum, Douglas fir, sycamore, and soft maple to equal a ton of coal, and two cords of cedar, redwood, poplar, catalpa, Norway pine, cypress, basswood, spruce and white pine.

Equal weights of dry, non-resinous woods, however, are said to have practically the same heat value, regardless of species, and as a consequence it can be stated as a general proposition that the heavier the wood the more heat to the cord. Weight for weight, however, there is very little difference between various species; the average heat for all that have been calculated is 4,600 calories, or heat units, per kilogram. A kilogram of resin will develop 9,400 heat units, or about twice the average for wood. As a consequence, resinous woods have a greater heat value per pound than non-resinous woods, and this increased value varies, of courdse, with the resin content.

The available heat value of a cord of wood depends on many different factors. It has a relation not only to the amount of resin it contains, but to the amount of moisture present. Furthermore, cords vary as to the amount of solid wood they contain, even when they are of the standard dimension and occupy 128 cubic feet of space. A certain proportion of this space is made up of air spaces between the sticks, and this air space may be considerable in a cord made of twisted, crooked and knotty sticks. Out of the 128 cubic feet, a fair average of solid wood is about 80 cubic feet.—"Canada Lumberman."

SMOKE BOXES FOR MERCHANT VESSELS

A RECENT issue of the "Hydrographic Bulletin" announces that the Bureau of Ordnance of the Navy Department at Washington has arranged for the supply of smoke boxes for merchant ships desirous of being equipped with them. The cost is approximately: smoke funnel, $125.00; smoke box, $25.00; phosphorus, $1.75 per lb. The smoke funnel is for the production of smoke on board the vessel and requires only the fuel for its continued use. The boxes are for throwing overboard and once used cannot be recovered. The Navy Department has announced as its policy that smoke-producing apparatus for the use of merchant vessels should be available for every vessel desiring to purchase same.

AT the Kawasaki Dockyard, at Kobe, a 9,000-ton steamer, complete with engines and masts on board, built for British owners, was recently launched in two months twenty-seven days from the laying of the keel. Within ten days of being launched her trials took place. Seven more steamers, of 9,000 tons deadweight each, are at present under construction at the same yard.

PRODUCTION METHODS AND DEVICES

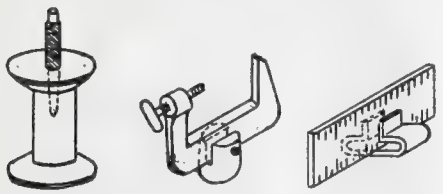
A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

USEFUL HOLDERS SUGGESTION

By E. F. C.

IT is a good idea, a great many times, where the same tools are constantly being handled over and over again to devise some arrangement to hold them, so that they may be convenient to pick up, or prevent them falling to the floor, and also to save space.

For instance in using a center punch



USEFUL HOLDERS KINK.

it very often happens that it will roll off on the floor, especially when in use on a drill-press table. A suitable holder for this purpose is a common wood-spool, in which the punch can be inserted in the hole where it is always handy when wanted. This suggestion is shown in Fig. 1.

In handling a clamp it is the usual practice to lay this down flat after using. When used in connection with other tools as jigs, etc., it takes up more room than can be spared. If a holder is made from a piece of round stock having a groove milled in it which can be fastened to the clamp with a screw, the clamp can be put down so that it will always remain upright, as seen in Fig. 2.

It is well-known that a scale is hard to pick up when resting on a plate or lathe carriage, especially if it has become immersed in oil. A convenient holder for this purpose can be made from a piece of sheet-steel, which can be snapped on the scale to hold it up straight, as shown in Fig. 3.

PRACTICAL OBSERVATIONS ON LUBRICATION

By D. O. Barrett

IT is surprising that in the design of up-to-date heavy-duty machine tools how much time and attention have been devoted to certain features of construction and how little to other seemingly unimportant parts but which become quite prominent when trouble occurs as it generally does. One particular place where the above is applicable is in connection with the countershafts usually supplied with all machine tools. On some heavy-duty lathes, in particular, built by manufacturers whose reputation tells the story of their success, countershafts are sent out which are constructed no more rigidly than those of five or ten years ago. We still find light shafting and hangers with long spans between bearings and with light clutches which are continually slipping and will not stand up to the regular work for which the machine is designed.

One source of continual trouble is the lubrication of the loose pulleys or the main driving pulley, in case a clutch is provided. These pulleys have, in most cases, a hole drilled through the hub into which a small quantity of oil may be poured but when the pulley starts to revolve centrifugal force will cause the oil to be thrown out. This applies equally well to the average drill press, which is provided with tight and loose pulleys.

In starting operations in a shop equipped throughout with new machine tools, trouble was experienced from these loose pulleys galling on the shaft due to insufficient lubrication. After loosening up several of these only to have the same thing occur again in a short time, the remedy as shown in Fig. 1, was decided upon after which no further trouble was experienced. The shafts were removed and a hole deep enough to reach to the center of the loose pulley put in, with a hand feed grease cup at the end. At the center of the pulley a hole was drilled entirely through the shaft and a couple of extra deep grooves were cut in the pulley bore. The grease could thus be positively forced where most needed. Another advantage was that the oiler could tighten up the cup while the driving belt was on the loose pulley. This method gave such entire satisfaction that all new countershafts and drill presses were equipped accordingly.

Another case where the same method was used to good advantage was in a heavy-duty lathe which had been operated but a few days when the back gears galled on the eccentric shaft. This was removed and drilled out as in Fig. 1 with

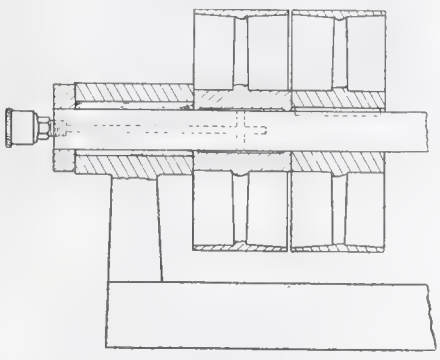


FIG. 1.

a grease cup at the end of the eccentric shaft and no further trouble was experienced.

The countershaft bearing on one of the larger boring mills was continually heating even though supplied with an excess of oil which would seem to be used effectively as the bearing was provided with a ring oiler. Upon investigation it was found that there were two separate bushings in the bearing with the oiling ring running between them as at A, Fig. 2. The oil was thus merely carried around the shaft between the bushings, very little running along the shaft and getting into the bushings. Had the bushing been made in one piece and then milled out at the top, for the ring as at B, the trouble would never have occurred as the edge of the bushing would have caught the oil, forcing it to travel along the shaft. Not having the material to make such a bushing the oiling ring was removed and the space filled with grease and a hand feed cup supplied. Little occurrences like these, while small matters in themselves, nevertheless cause great inconvenience and serve to ruin a reputation which might have been built up on the quality of the machine in general.

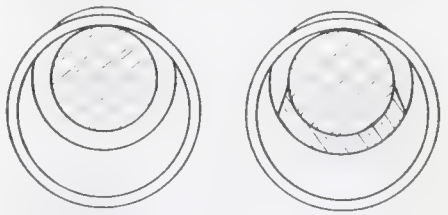


FIG. 2.

In connection with stationary gas engine work, the usual method of lubricating the cam rollers is shown at A, Fig. 3. These rollers are of either tool steel or machine steel case-hardened, and are made rather a loose fit on the hardened steel pin. They are generally made a fairly close fit in the slot which is milled in the end of the push rod which is of square cold drawn steel. A hole is drilled radially through the hole for oil but if the hole should happen to be in any other position than vertical and the roller is against the cam, the average operator does not take the trouble to turn the roller but contents himself with pouring a little oil on the side. Should the hole be filled with oil, as soon as the engine is started the centrifugal force will immediately throw it out so that in any case, the method is a failure.

A much better plan is shown at B where the slot is somewhat wider than the roller and the pin is provided with an oil groove for the full width of the slot. Oil applied at either side of the roller will at least fill the groove and cover that part of the pin which is exposed and as soon as the engine is started the roller will travel from side to side spreading the oil effectively over

the pin. Oil may, of course, be equally as well applied while the roller is turning.

The usual method of lubrication for clutches and cut-off couplings attached to

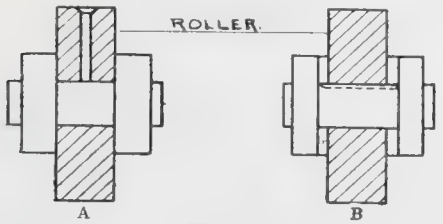
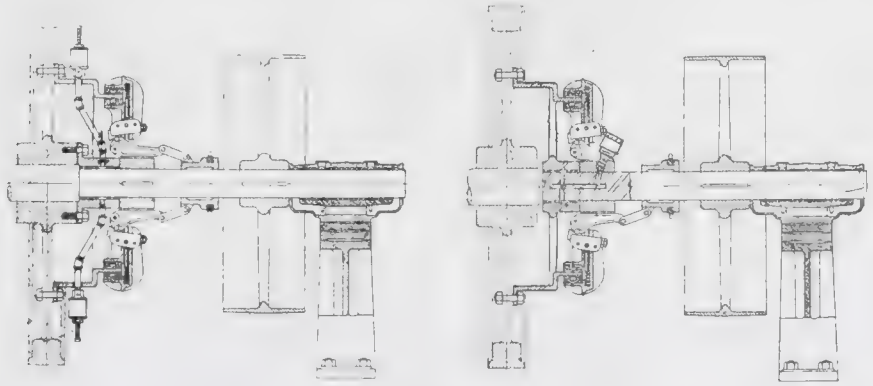


FIG. 3.

gas oil engines is shown at A, Fig. 4. The friction ring is bolted directly to the flywheel and the bearing for the shaft carrying the driving pulley is bolted to the wheel or cast integral with



A FIG. 4. B

the ring. The gripping mechanism is keyed to the extended shaft. In this way the shoes remain stationary and adjustments may be made on the friction surfaces by merely throwing out the clutch. Self-feeding grease cups are attached to the ring with pipes leading to the bearing. The cups can, of course, be filled only when the engine is shut down and no attention whatever can be given them after the engine is in operation no matter how many times the clutch may be thrown out, with the extended shaft stationary. Again, this style of cup is not very reliable in its operation since the spring operated piston in the cup may not be able to force the lubricant through the long pipe, especially in cold weather.

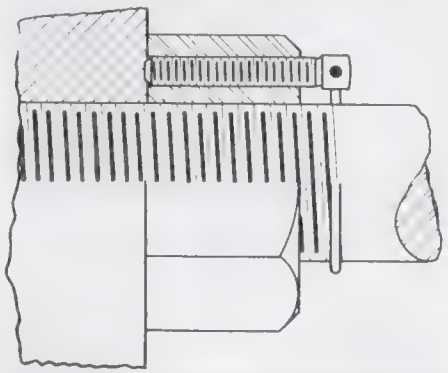
At B is shown a method which has proved far more satisfactory and costs little, if any more, to install. The shaft is drilled from the end and then plugged, the hole being deep enough to reach back to the member carrying the shoes. A hole is drilled through the shaft at the center of the bearing and another hole is drilled into the shaft to meet the center hole and corresponding to the grease cup which is carried in the hub of the mechanism. By throwing out the clutch and allowing the engine to run, the cup may be screwed down at any time thus insuring an ample supply of lubricant. Of course, it is necessary that the part carrying the grease cup maintain its exact position with relation to the shaft and this may be accomplished by drilling a shallow hole in the shaft for a set screw which is usually provided in the casting. Hand feed cups are the best for this arrangement as the grease may be positively forced where needed.

FASTENING SCREWS AND NUTS

By A. L. Loy.

CONSIDERABLE trouble had been experienced with the nuts on the piston rods of gas engines working loose. These nuts were used as lock nuts on the rod where it entered the crosshead. Tightening up the nut draws the threads on the rod to the back of those in the head, so that the pressure of the explosions comes directly on the nut. Should the nut become loosened only slightly, the small movement of the rod in the head will soon work the nut back, and either cause the piston to unscrew or, as sometimes happens, the piston rod is forced through the crosshead, tearing out the threads.

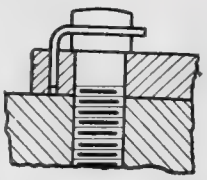
The nuts were drilled and tapped and the cup point set screws tightened against the crosshead after the main nut was tightly drawn up. Holes were drilled through the head of the cap screw and a wire was run through and then wrapped around the rod and the ends fastened together. Since the screw would cut into the metal of the crosshead a certain amount, it would have to back out this amount before the main nut could move



METHOD OF FASTENING LOCKNUT ON BACK OF CROSSHEAD.

and the wire very effectively insured that these parts would remain tight.

A wire may also be used very satisfactorily in the locking of cap screws, as shown in the cut. Holes are drilled through the heads of the screws, and also down into the piece being held by the screw, as close to the screw as convenient. The wire is pushed down into the hole and then pulled through the



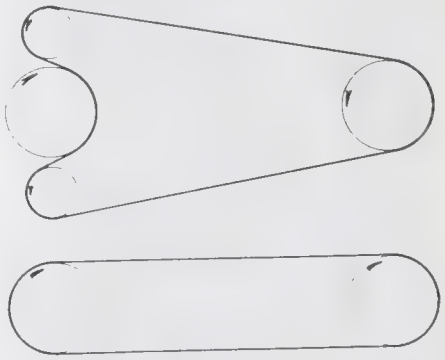
LOCKING CAP SCREW WITH WIRE.

head of the screw and cut off. It is immaterial whether the holes line up, as the wire will simply be bent to correspond and cannot come out unless deliberately removed.

A REVERSE BELT DRIVE

By A. L. Loy

IN a crushed stone plant which the writer recently visited the reverse belt drive for the main crusher was obtained in the manner shown in the drawing rather than by crossing the belt as is the usual practice. Those in charge of the plant were unable to explain the advantages obtained by this design but claimed that it had given perfect satisfaction. Certainly its efficiency would not be as great as the crossed belt due to the friction loss occasioned by the two idlers and the reverse bend would be harder upon the material of the belt. Of course, it is possible to secure a



REVERSE BELT DRIVE.

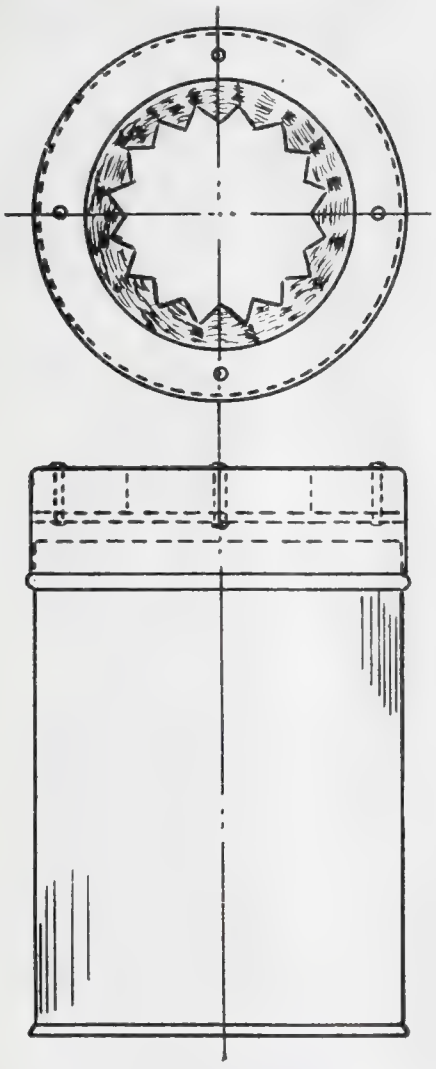
greater arc on contact by the proper location of the two idlers and this may have been the deciding factor.

TAP CLEANER AND CHIP BOX

By J. Edwin

WHEN cleaning chips off a tap, the ordinary method is to wipe out the tap grooves with a piece of waste or brush. The tap, as is well-known, requires to be cleaned off for each new hole tapped out. In doing this, generally the chips fall on the floor, the vise and even the work bench. In the illustration is shown a very convenient method for cleaning off a tap at the same time the chips falling in a receptacle for this purpose. It consists of a tin-can, having a section of the cover cut out, underneath of

which, is fastened a thick felt washer notched out as shown. The tap is simply placed in the opening and then rubbed upward against the notched edges of the washer which removes the



TAP CLEANER AND CHIP BOX.

chips, and these fall in the can. A thin steel washer is fastened under the felt with rivets to secure this in the cover. The cover is removable so that the chips can be emptied out.

GEAR SHAPER ADJUSTMENT HINTS

WHEN machine tools of a specialized type give occasional trouble, either in their operation or in the class of work produced by them, it can, in the majority of cases, be traced to a certain lack of knowledge on the part of the operator. It is commercially impossible to make all types of machines fool-proof, and a certain modicum of brains is desirable in the operation of all machines which are more or less automatic in their actual working. The gear shaper is an example of this class of machine, and with a view to insuring correct knowledge of essential facts by the operator, the Fellows Gear Shaper Co. have recently issued an instruction sheet regarding the mounting and clamping of gear shaper cutters. The accompanying illustration is reproduced therefrom and shows correct and incorrect methods of mounting the 4-in. cutter for "pull" and "push" strokes; the instructions applying equally to the 3 in. cutter.

Gear shaper cutters are made from high-speed steel, and, as is well known, high-speed steel has not the same strength as ordinary carbon steel, consequently greater care must be exercised in handling it. Special care should be taken to see that the proper washers, collars and nuts are used, and that the cutter-spindle, washers, etc., are free from fine chips and oil; also that the cutter has been sharpened on the top face to the proper cutting angle. The cutter used for the general run of work, and especially for finishing, has a top angle of 5 degrees (see illustration), and the washer which comes in contact with this face of the cutter should have a corresponding angle; if anything, it should be less than the angle of the cutter, so that the pressure will come at the circumference rather than near the hole; this not only serves to relieve the strains from the weakest portion of the cutter, but holds it more rigidly at that point where the greatest grip is desired.

Fig. A shows the correct method of mounting the 4-inch gear shaper cutter, when working on the "pull" stroke. Reference to the illustration will show that the top washer and cutter have the same angle, and that the lower washer is relieved in the centre and supports the cutter close to its outer circumference.

Fig. B shows the incorrect method exaggerated. Here it will be seen that the top washer has a greater angle than the angle on the top face of the cutter. When this is the case, the strain of clamping is confined to the weakest section of the cutter and there is a liability of cracking the cutter, when mounted with a washer of this type.

Fig. C shows another incorrect method of mounting the cutter. Here the lower washer is too small in diameter and does not support the cutter beyond its weakest section, as indicated by the arrows. Note that the washer for the 3-inch cutter should never be used for the 4-inch cutter.

Fig. D shows the correct method of mounting the gear shaper cutter when operating on the "push" stroke. For this purpose a special nut as illustrated is provided. Do not use nut shown at A.

Fig. E shows an incorrect method of mounting the 4-inch gear shaper cutter. Note, the collar is too small and does not support the cutter beyond its weakest section. The nut is not provided with a collar, and also does not support the cutter properly. A cutter so mounted is very liable to crack, because it has a tendency to vibrate when cutting and is not supported close enough to the circumference to hold it rigidly against the thrust of the cut.

Fig. F shows the correct method of mounting the 4-inch thin-web cutter. Note, the special spindle extension collar that is necessary, also the special nut. Do not use nut or collar shown at D on the thin-web cutter. Also note that a special spanner wrench is necessary for tightening nut used in connection with the thin-web gear shaper cutter.

In sharpening the gear shaper cutter special care should be taken to see that both faces are parallel with each other. If the sharpening is done on a Universal grinder then care should be taken to see that cutter runs true. If the sharpening is done on a rotary vertical surface grinder, the same care should be taken to see that the cutter runs true. If this point is not observed, and the cutter runs eccentric, then it will vary in thickness and the faces will not be parallel to each other. The variations should not exceed 0.00025-inch.

Do not use an extension pipe on the regular wrench furnished for clamping the gear shaper cutter. The thread on the spindle is a fine one and holds the cutter with the required rigidity. When clamping, and this applies especially to the thin-web type shown at F, see that the cutter is mounted properly and is seating

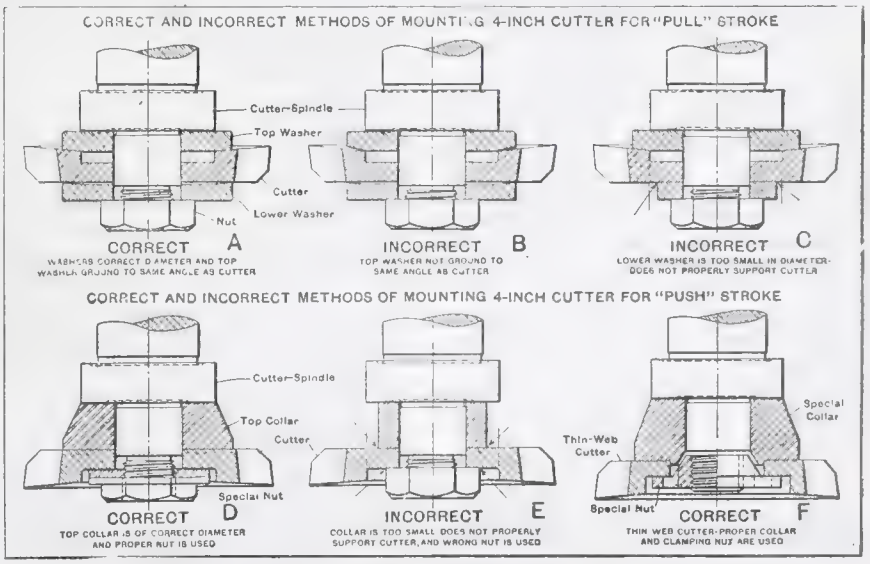

CORRECT AND INCORRECT METHODS OF MOUNTING 4-INCH CUTTER FOR "PULL" STROKE
Cutter-Spindle
Top Washer
Cutter
Lower Washer
Nut
CORRECT A
WASHERS CORRECT DIAMETER AND TOP WASHER GROUND TO SAME ANGLE AS CUTTER
INCORRECT B
TOP WASHER NOT GROUND TO SAME ANGLE AS CUTTER
INCORRECT C
LOWER WASHER IS TOO SMALL IN DIAMETER-DOES NOT PROPERLY SUPPORT CUTTER
CORRECT AND INCORRECT METHODS OF MOUNTING 4-INCH CUTTER FOR "PUSH" STROKE
Cutter-Spindle
Top Collar
Cutter
Special Nut
CORRECT D
TOP COLLAR IS OF CORRECT DIAMETER AND PROPER NUT IS USED
INCORRECT E
COLLAR IS TOO SMALL DOES NOT PROPERLY SUPPORT CUTTER, AND WRONG NUT IS USED
Special Collar
Thin-Web Cutter
Special Nut
CORRECT F
THIN WEB CUTTER-PROPER COLLAR AND CLAMPING NUT ARE USED

ILLUSTRATION USED ON GEAR SHAPER INSTRUCTION SHEET.

correctly on the collar before the nut is tightened to the full extent.

Do not use a gear shaper work arbor that does not run true. Test the arbor frequently with a good indicator when in position in the machine. The maximum eccentricity of the arbor is .00025 inch when cutting gears that must be accurate. If the work arbor runs out of truth, the pitch circle of the gears cut on it will be eccentric with the hole.

PATTERN MAKING NOTES

By J. W. Broadbent

Fillets

A CASTING would never pass the examination of a critical inspector unless all sharp corners were eliminated; not only has a casting a more finished appearance but it is greatly strengthened by putting fillets in all corners as in Fig. 5.

FIG. 5.

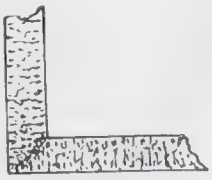


FIG. 6.

Cast iron is composed of a number of minute crystals and these crystals always set themselves at right angles to the cooling surface, thus in a right angled casting, Fig. 6, there will be a break in the crystals in the angle of the casting, which will form a permanent source of weakness, and under ordinary conditions the casting will break here before anywhere else.

By forming a curve, however, as shown in Fig. 7 the crystals will form without any line of separation; and it is

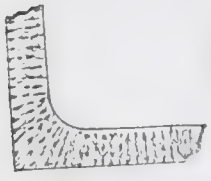


FIG. 7.

FIG. 8.

easily seen that a hollow cylindrical form of casting Fig. 8 will be the strongest, because the crystals will all radiate symmetrically.

From a moulder's point of view, fillets are a great convenience for they enable him to make a much cleaner casting, the sand not having the same liability to break away as in a square corner. Several methods are adopted by the pattern maker for filling in these angles,—either by working the fillet out of the solid wood of the pattern, or making them separately of wood, leather, beeswax, putty or lead.

Kinds of Fillets

Of these methods the first one always proves the most satisfactory and a good example is a hub for a pulley, the fillet of which can be very conveniently turned to make a good strong job by recessing the web of the arms as in Fig. 9 which method does away with the feather edge of the fillet.

Figs. 10 and 11 show two methods of making strong fillets, but owing to the expense are seldom used on any but standard patterns. For all straight surfaces the wooden fillet answers the purpose fairly well, but has a habit of curl-

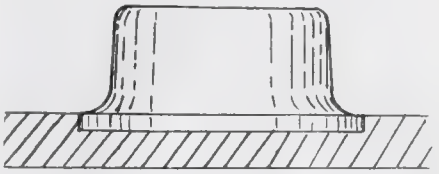


FIG. 9.

ing away from the pattern when glue is applied.

If the fillet is made with an angle of 93 deg. and the glue put on very sparingly, no difficulty should be found in making it lie down snug in the angle of the pattern.

Leather Fillet Preferred

Leather fillet is now the most popular and by far the best to use, for it can be easily adjusted to any kind of surface, either straight or curved, and is easily fastened to the wood by either shellac or

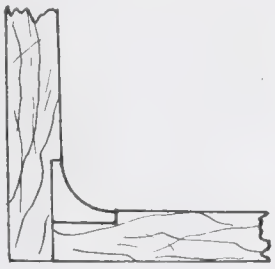


FIG. 10.

thin glue. It can be bought in all sizes from ⅛ in. up.

The method of applying is to cut the fillet to the necessary length and lay it on a board where the adhesive material can be easily brushed over it. It is then laid in the angle of the pattern and rubbed into position with a tool rounded at the end so as to give the required curve to the soft leather.

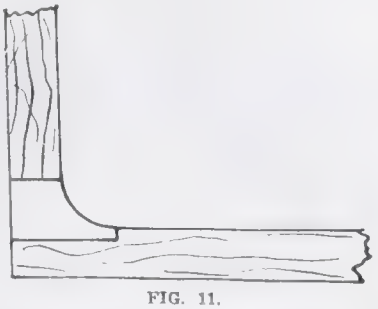


FIG. 11.

A rounded piece of wood is a common tool used for this purpose but Fig. 12 shows a better tool for applying leather fillet, it is made by fastening different sizes of ball bearings to a round rod, and no pattern maker's kit is complete without a set of these.

All surplus glue should be wiped off before it sets, which is easily done with a piece of rag dipped in hot water.

There are some who claim that fast-

FIG. 12.

ening leather fillet with shellac is a waste of good material. It is true that glue is cheaper than shellac, but when we consider the time spent in wiping off all the surplus glue, and that if the shellac does ooze out a little the damp sand will not stick to it, the ultimate cost works out about the same.

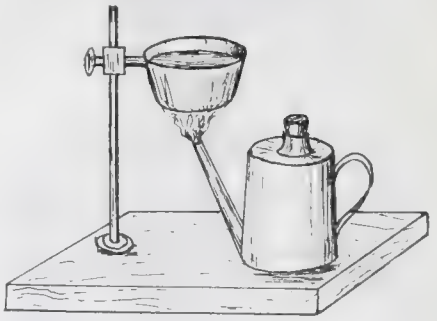


FIG. 13.

Beeswax and its Application

For some classes of patterns, beeswax is an indispensable material, not only for fillets and filling nail holes, but for parts of the pattern itself. It should be applied hot after the first coat of shellac has been put on the wood, and if a small proportion of resin is added to the wax, it will adhere better and set harder. Fig. 13 illustrates a cheap and effective apparatus for melting beeswax, The beeswax is melted in an ordinary tin cup heated by an alcohol lamp, the beeswax being applied with a curved spoon Fig. 14.

Putty takes too long to harden to make a good job and it is necessary to give the angles a light coat of lead and

FIG. 14.

oil before using the putty or it will not stick. Lead fillet has never met with much success, as it is heavy, takes too much nailing and does not lie close to the wood.

Three-Cornered Fillets

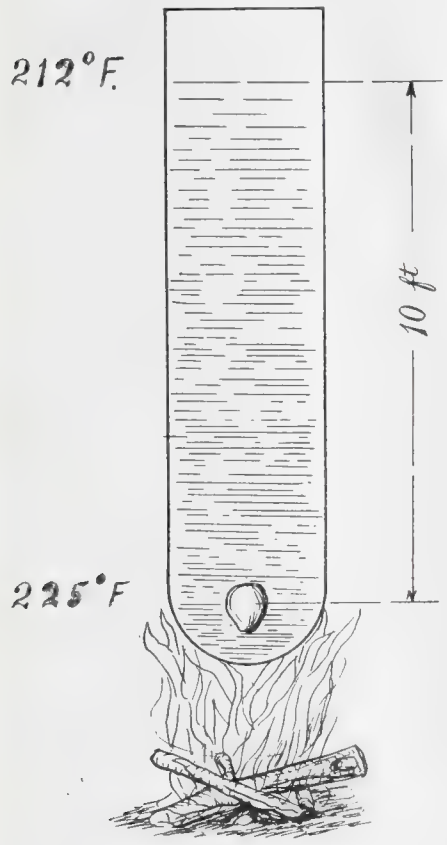
It is often necessary to make a pattern in a hurry and the pattern-maker decides to let the moulder cut the fillets out of sand. In these cases the appearance of the finished casting depends upon the skill of the moulder, and if appearance is not to be considered, it is advisable to use three-cornered fillets, they are easily nailed into the angles and fully answer the purpose for which fillets are intended, that is—to strengthen the casting, or to prevent shrinkage in a place that would weaken the casting and to make the moulder happy by not having any sharp corners of sand in his mould.

WHAT IS THE TEMPERATURE OF A STEAM BUBBLE?

By N. G. Near.

IT is generally assumed that the temperature of the water in a steam boiler is practically uniform from top to bottom, but it occurs to the writer that in some of our modern boilers there may be a considerable difference, especially in the steam temperature.

It is often explained that in the generation of steam, small steam bubbles form at the bottom of the boiler, whether tubes or shell, and that these bubbles then shoot upwards because of their low density. However, according to



ILLUSTRATING REMARKS ON TEMPERATURE OF STEAM BUBBLE.

steam tables, the temperature of a steam bubble at the bottom of a large boiler must be sometimes as much as 20 deg. F. higher than the temperature of the steam in the steam chamber.

Take the example shown herewith—a vertical tube holding 10 feet of water. The water pressure at the bottom is 4.34 pounds per sq. in., or 19 lbs. absolute. The temperature of steam under such a pressure must be at least 225 deg. F. The top of this tube being open to the atmosphere, the temperature of the steam escaping would therefore be 212 deg. F. at sea level. Hence we have a difference in steam temperature of 13 deg. F. The small round object drawn at the bottom of the tube is a "steam bubble."

OILING THE LINESHAFT

By A. L. Loy.

IN passing through a machine shop the writer noticed that about three feet below the main lineshaft was placed a platform about twelve inches wide. The shop was rather long, and this platform, consisting of a plank laid on brackets fastened to the building columns, extended the full length. When oiling the shaft, the oiler could traverse the entire distance without once getting to the floor, doing away entirely with the use of a ladder. The platform also came in handy in putting on or making repairs to belts. Of course, such an arrangement is possible only where the lineshaft follows the building columns.

MOLYBDENUM, ITS ORES AND USES

THE increasing use of what till recently have been classed as semi-rare metals, such as tungsten and molybdenum, etc., has created more than passing interest in their origination, geographical location, and methods of extraction from the ores. The development of molybdenum mining in the Province of Ontario is a fact of more than passing importance in view of the uses which are already in existence for this material. The practical and commercial characteristics of the metal are dealt with at some length in an article in "Engineering" substantially as follows:

Classification

Molybdenum belongs to the group of heavy metals comprising tantalum, titanium, tungsten and vanadium, which are capable of imparting special properties to steel. It was discovered by Hjelm in 1783; its symbol is Mo; it occurs as a solid; its atomic weight is 96.0; specific gravity 8.6-9.01, and specific heat 0.066. Molybdenum is a metallic element whose compounds are quite widely diffused, but its ores are very rarely found in considerable quantity. It has never been discovered in nature, but invariably alloyed with some other compound, of which it generally forms but a limited percentage. It is a white metal, hard, and somewhat malleable. The ore of molybdenum, on which the world depends for its main supply of the metal, is molybdenite, a sulphide, MoS_2, which occurs in hexagonal plates or masses, thin, foliated similar to graphite, and much resembling that mineral. This ore has a grey color and streak, olive-colored on white paper; it can be differentiated from graphite by its high specific gravity. Molybdenite occurs in a great variety of rocks in different parts of the world, including practically all the main groups, but its occurrence with granite and the more acid rocks, of which that is the type, is by far the most usual and typical. When molybdenum ores occur in veins, in quantity, they are usually in the form of oxides, as well as of sulphides.

Another mineral which has been found commercially suitable as a source of molybdenum is wulfenite, a lead molybdate. This ore, to be useful as a source for molybdenum, must not carry as impurities large quantities of copper, arsenic, vanadium or iron. The ease or difficulty of concentration has much to do with the feasibility of profitably mining and developing molybdenite deposits. Unless the minerals occur in tolerably large lumps, so that they can be hand-picked, it has been found somewhat difficult to discover a satisfactory method of separating the ore from the gangue material. Both the oil and the static electric methods have been used with varying success. Only rarely does the mineral occur so coarsely divided that it may be hand-picked; the ores are prepared for the market in two forms—powdered and as ferro-alloy.

The powdered form is obtained by heating some form of oxide with a reducing agent, such as carbon in the form of charcoal. The first stage produces the dioxide, which is not readily volatile. Prolonged heat and high temperature result in the production of the metal. Ferro-molybdenum, with varying molybdenum content, is made by the use of the electric-resistance furnace, either direct from the sulphide, or from the roasted high-grade sulphide. By this process the impurities can be slagged off; in the case of the powdered metal the impurities are subject to extraction by means of a solvent, otherwise they remain with the metal.

Niagara Activities

Molybdenum alloys are made in part at the Niagara Falls by means of the electric furnace, and when they are made elsewhere metallic aluminum is largely used as a reducing agent, which is also a Niagara power product. These alloys form the chief constituent of a group of products which are absolutely necessary in the manufacture of high-speed tool steel, magnet steel and a variety of special steels. Alloys can be formed of the two elements, molybdenum and tungsten, by compressing a mixed powder into briquettes, and then heating them with an electric current in an atmosphere of hydrogen. Alloys can be produced varying in composition from 100 per cent. molybdenum to 100 per cent. tungsten. Thermal and microscopical analyses show that molybdenum and tungsten are completely isomorphous. All alloys of this series are malleable and ductile under proper conditions. Alloys of molybdenum and tungsten have been suggested as a substitute for platinum and its alloys, the prices of which are abnormally high. It has been ascertained that, except in two respects, molybdenum meets the requirements of a practical substitute. These two defects are its relative ease of oxidation and the difficulty with which it can be soldered; but both appear to have been overcome by coating with a precious metal or alloy.

Several localities for the supply of molybdenum ores may be briefly referred to. Ores have recently been found in New Zealand, at Takata, and samples assayed are stated to have contained 50 per cent. of molybdenum oxide. Ores occur in New South Wales and Queensland; works for treating them have been established in Sydney.

Several deposits of the ores occur in Eastern Ontario; these have been opened

out and are being worked. There are dressing plants at Renfrew and Ottawa. Ferro-molybdenum is being made at Orillia and Belleville. The so-called "sierra" districts of Peru are highly mineralized, and contain molybdenum ores, as well as many other minerals. For several years important molybdenite mines near Phelomarken, in Norway, have been worked in a somewhat primitive manner, but during 1916 a more modern system has been introduced.

Other Developments

Up to the close of 1911 the demand for molybdenum remained stationary and very limited in the United States; with the exception of some slightly increased use of the metal in Europe the outlook did not look at all encouraging. The production in the United States was very small hardly worthy of notice—not due to any scarcity of the substance, but to small demand. More recently a larger supply was required, which resulted in an active search for molybdenum ores in the United States. During the spring of 1915 molybdenite concentrates were produced from a mine near Empire, Colorado. This is the first American mine to be extensively operated for molybdenite.

There are several known localities in the United States and Mexico where molybdenum ores could be mined profitably; they occur in more or less widely separated localities north of the international boundary of the United States and Mexico, in the Santa Rita and Patagonia Mountains, not far from the Southern Pacific Railway; in the Pinna and Santa Cruz counties, Arizona. Mines have been opened up some thirty miles south-east of the town of Tucson. Wulfenite has been found in a number of places in Utah, Nevada, Arizona and New Mexico, also to a very limited extent in California and some other States.

Some Uses

There are many uses to which molybdenum and its various compounds have been put, as ammonium molybdate to determine phosphorus in iron; as a fireproofing material; as a germicide; as a disinfectant; as sodium molybdate to color pottery and porcelain blue; to dye silks and woollens; as molybdenum tannate to color leather; and as molybdenum "indigo," Mo_2O_3, it is a useful but expensive pigment for india-rubber, which, it is stated, is not injured by its use. Molybdite, known as molybdic ochre, is a straw-color to white mineral containing from 50 per cent. to 60.7 per cent. of molybdenum, and is considered to be a hydrated iron molybdate. There are a dozen or more known salts of molybdenum, most of them of only scientific value.

The terms "unit" or "content" are frequently used in quoting the price of molybdenum ores; the former refers to the price per net ton of ore guaranteed to contain a given percentage, possibly with bonus or penalty per unit for anything over or under the given percentage. The word "unit" is used in the same sense as per cent. The "content" system is a somewhat simpler mode of quoting, thus: 75c per pound for MoS_2 contained in concentrates of 90 per cent. molybdenum sulphide.

INDUSTRIAL RESEARCH

THERE is an imperative need for the extension and better recognition of research work. It has been said, truly, that there are few things more necessary for the sound economic development of manufacture than organized industrial research, and that is the considered opinion of the majority of leading engineers and metallurgists. Results are seldom obtained by casual workers, or those who, only interested in scientific investigation, pay no attention to the commercial side of their work. Practically all important results have been obtained by those who have undergone special training and who have devoted a great part of their life's work to ceaseless experiment and research. To such work it is necessary to pay undivided attention, with a view to finding the underlying laws of nature and to simplifying our understanding of those laws. After the war, it is more than likely that the future of every country will depend to a vital degree on scientific research; and, as has been said, whether any particular nation is to become a leader or a follower will depend to a considerable extent upon the facilities which that nation affords to those of its people who desire to undertake work of a scientific character with a view to improving its commerce and manufactures.

What is the purpose of industrial research? Surely its final object is to enable us to use the resources of nature to-morrow more efficiently than we do to-day. The engineering and metallurgical supremacy of the future will certainly belong, as an American writer once said, to those who conduct organized research work, improve their product by the knowledge thus gained, and keep ahead of others by constantly improving the quality and increasing the efficiency of their product by new developments.

Only recently an entirely new branch of chemistry, the chemistry of the free atom, resulted from the work of the British chemist, Langmuir, in the Electro-Chemical Research Laboratory of a certain electrical engineering concern; other cases might be cited, but, after all, the scientific research laboratories represent, as Steinmetz recently pointed out, only a part, often the minor part, of the research work done within the industry, and in many places ample opportunity is afforded for the right men to enter and carry out independent scientific research. In the United States, for example, it is the custom in the materials testing laboratories, in the standardizing laboratories, in the apparatus testing departments, and in the development departments of the big manufacturing houses to allow research work to be carried out, and not only to encourage it, but to fit up laboratories and workshops for those who, showing promise, wish to engage in such work. This is an example which is already being followed in England by a few firms, but there is urgent need for the development of the movement, which is perhaps of more vital importance to England, and to English manufacturers, than it is to any other country, if she is to keep her predominant position amongst the nations of the world.

CEYLON MONAZITE

THE mineral survey now being conducted in Ceylon in co-operation with the Imperial Institute has led to the discovery of beach deposits of monazite sand, which will usefully supplement the commercial supplies of thoria required for the manufacture of incandescent gas mantles. Samples of the sand have been investigated by the Imperial Institute, and the results are so promising that the Government of Ceylon has arranged to work the deposits. Suitable British concentrating machinery has been selected by the Institute for the purpose, after experimental trials, and will shortly be shipped to the colony.

This is the latest chapter in the story of the long struggle to rescue the gas mantle industry from German domination. Formerly the monazite deposits in Brazil were the only commercial source of supply of thoria, and these were controlled by the German Thorium Syndicate. The Brazilian monopoly enjoyed by this syndicate was broken by the discovery of extensive deposits of monazite in the native State of Travancore in India, so rich that samples examined by the Imperial Institute were found to contain nearly twice as much thoria as the Brazilian monazite. The German syndicate, however, obtained control of the company formed to work the Indian deposits, and they continued to exercise a dominating influence over the industry till the outbreak of the war. Since then the company has been reconstructed and given a British character, and it is understood that another portion of the deposits in Travancore has been taken up and will be worked by a second British company.

It is of interest to note that the work of the Mineral Survey has shown that Ceylon can furnish several other thoria minerals besides monazite. Among these is thorianite, the richest known source of thoria. This new mineral when it first came on the market was sold in England at as high a rate as $8,000 per ton, but the deposits have proved to be limited.

HE was under sixteen years old, but was very anxious to go out and do his bit, so he marched up to the recruiting office and boldly told the sergeant he was "nineteen and a half." The sergeant looked at him with a twinkle in his eye. "My lad," he said, "do you know where boys go to who tell lies?" "Yes, sir," came the prompt reply, "they go to the front." "Whatever do you mean?" asked the sergeant "Well, I've three pals at the front what's not seventeen, an' you passed 'em, anyhow," was the boy's rejoinder.

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions—Your Co-operation is Invited

BALL BEARINGS FOR HAND-POWER DETAILS

By T. J.

BALL bearings—both of the "journal" and "thrust" type, and either parallel or radial—are an acknowledged success in the elimination of friction and consequent saving of fuel when applied to power-driven details. On that point all engineers are agreed. But, why not carry their application a big step farther? Why not apply them to journals of "hand-power" details? More especially now when there is the necessity for the greatest possible output, and every possible means should be acquired for keeping the wheels of the factory turning sweetly. Could there be any better way to effect this than to apply ball bearings to all our hand gear? Such could be applied to all hand-winches, four wheel hand trucks, sack trucks, etc., and all the hand-power accessories which go to make up the sum total of the means of transporting goods in a factory or outside erection, and even applied to the lifting of shells for the big guns on the battlefield. At the present time it is imperative that not an ounce of power, either manual or motive is wasted and to provide the most efficient means of hand transport of goods is certainly a matter demanding the closest attention.

WAR EXPEDIENTS IN FRANCE

By D. Street

LINKED with the question of assisting agriculture, particularly from the moment when peace is declared, consideration is being given in France to the best means of providing the farmer with the most efficient mechanical aids for increasing his production.

Something has already been done as the result of the government grant in January last, but it is desired that arrangements should be made now for French industry to make adequate deliveries of the necessary appliances not less than six months after the close of the war. To this end it has been proposed that committees should be appointed by the French Ministry of Agriculture to determine exactly what will be needed and that munition works should remain under State control for the purpose of carrying out the manufacture. It is contemplated that local centres of instruction in the use and upkeep of mechanical cultivators shall be established. It would be desirable for this part of the scheme to be initiated at once by educating the farmer in the employment of motor tractors, seeing that the government's efforts in this respect have not been crowned with the success they merited.

The project of letting munition works turn over to the manufacture of motor tractors—of which it is estimated that 20,000 would be required—has, however, met with some criticism. It is represented that the French manufacturers of agricultural and other machinery ought rather to be placed in a position to fulfil the orders by helping them to secure the material and the men. On the other hand it would appear doubtful whether the general engineering industry of the country can reconstitute itself quickly even to cope with the demands for railway material.

National Footwear

The French government have now made satisfactory arrangements for State manufacture and distribution of boots for the needs of the civilian population, and the military authorities have approved of the details of the scheme, which is being carried out by the principal boot manufacturing associations under the control of the Ministry of Commerce, the leather being distributed by the Ministry of War. Each bootmaker will have a distinctive mark for his own goods, and will keep a record of the raw material allotted to him, and of his deliveries of "national" boots. The maximum profit allowed to the manufacturer has been fixed and no manufacturer may refuse to participate in the national scheme. Selected types of footwear will be arranged suitable for (1) men, (2) women, (3) youths and girls, and (4) children. These will be standardized, as well as a heavy type of workman's boot. It is hoped that by the time the hard winter weather sets in 500,000 pairs of national boots a month will be coming out of the factories, and that ultimately sufficient boots for the whole of the civilian population of France will be forthcoming.

Although under this scheme the use of leather needed by the Ministry of War is precluded, good material is evidently to be used throughout the national boot. The first sole is to be cut from the trimmed imported hide, provided it is not stout enough for army boots, and the second sole from vegetable tanned South American, Cape, Abyssinian, China or Madagascar hide, whilst the uppers are to be made from either tanned or chromed horse hide, imported cow hide, or calf skin, or Indian kip.

AWAKENING YOUR ENERGY

By W. Doolittle

THE life worth living, the life called real and purposeful, is one that is moulded and made by persistent striving and constructive energy. Swinging one's self forward daily with determination, forward and on a body animated and alive from head to heels.

We are not to be as vegetables that sprout up in the springtime of youth and wither and fall in the winter of life; living and breathing, and drawing substance; anchored in the same spot; without having made a single inconspicuous move.

Why Are You?

Look you deep, and consider well. The pangs of child-birth have been suffered and endured for you, not in order that you might be what you are now, but what you ought to be. Not in the lagging, bragging lazy-bone class, but, a living, wide-awake, alert, thinking human being.

You, who step into to-day, you of that class who are in the habit of wasting your time in listless endeavors, you, yourself, the human form that you are, awaken! The great energizing force within you calls you now to meet a challenge. A challenge direct from the great universe, not alone to give battle to the elements of earth and sky, but to push forward, forge ahead, and become an active, persisting, determined energized individual.

You are not to stand and stare; nor should your arms be akimbo or hang lifeless at your sides. But on these your sleeves should be rolled up; your spine fully straightened; your head and eyes clear; your nerves calm but vibrating; every part of your anatomy ready at all times to be brought into play. These are the pre-requisites to turn yourself from what you are now, into an ever-ready-to-thrust forward type of mortal.

We desire the good things, the luxuries of life; but instead of pushing forward and trying to obtain these by legitimate means, many live on the supposition or hope, that some day, someone, will be accommodating enough to die and leave them the wherewithal to secure these. The point to be emphasized is, that the thing worth the having, is worth the most energetic striving for. The mere thinking and wishing method has no place beside the man with unflinching power, whose superabundant energy is going to capture all that he most necessarily needs or wants. The great fault with the average of mankind is, that a little feeble expenditure of energy exerts such a strain upon one's ordinary efforts, that a two hours' relaxation is required for each hour's exertion. A slight bend of the back-bone requires a stimulant to put it back in place.

Many Are Lacking

Very few of us have that get-up-and-go, that swinging energetic gait, that forward going spirit, that buckles up and turns over obstacles. We spend much time in useless thought. And too much time in babbling talk. We know little of quietness—the great silence that

moves steadily, uncomplainingly forward, that makes each action count for something useful and big. The best that was ever obtained, or ever will be obtained, fell in the right white palm of the man who went determinedly forward, and stood his ground till he got it.

You who sit and whine, you who despair, wake from your sleep. The day is far fetched. Things may look to you more hopeful to-morrow, but to-day, this very moment, if you choose to make it so, has more hopes that can be realized if you are only wise enough, know enough to turn your steps towards them. Your energy is the mainspring in the clock of your existence. And it has run down a long ways. A few winding turns will not give you much speed. You need a thorough winding, and that winding process needs to be enacted with despatch.

Deep in the marrow of your bones, along the entire length of your spinal column, your cords and sinews,—all that is within you of flesh and blood and soul, is one vast network of ripping, vitalizing human energy. Only the will of you, only the brain of you, needs to press the starting button to set in motion that force called energy. And that energy, be what it is, is bound by the propelling power of which it is composed, to force you ahead in unswerving, unrelinguishing epoch-making achievements.

Can that fact be driven home, deep in the core of that being you call self. That which to you is a human frame built on symmetrical lines. Endowed at the top with a thinking machine called a brain. Extremities called arms and hands that do your bidding, limbs and feet that propel you. Can you not awaken these to serve with greater energy, with greater power, with greater activity? Working towards some grand end, be it small or big, but working and incessantly working, striving each day towards accomplishing something, in putting the mark of your personality and name, indelibly and uneraseable upon that which your efforts expend.

FLEXIBLE TURBINE GEARING

By L. E.

THE problem of ensuring equal distribution of pressure over the whole surface of the wide fine-pitched gears now coming into use for marine turbine speed reduction is being tackled in many ways. H. A. Macalpine, who was the first to act upon the growing realization of the matter, has proceeded upon the line of supporting the pinion in a rocking or floating cradle designed to permit of a continuous self-adjustment of the pinion to the wheel. In one of his arrangements the frame supporting the pinion is constructed so that the solid metal will afford a certain amount of spring whereby when the tooth pressure becomes unduly heavy on one side of the gears, due to unavoidable imperfections in gear-cutting or disalignment of the two shafts, that side yields just enough to allow the pressure to spread equally over the whole face. In another arrangement the same effect is obtained by sustaining the pinion bearings on interconnected hydraulic pistons.

The Macalpine device has now had extensive trial both on large mercantile vessels and on several battleships, and, though there has been a good deal of controversy on the matter, may be said to have established its claim to show a marked though varying advantage over the usual type of gearing on the respective scores of efficiency, durability, smoothness, and silence of working, amount of lubrication required, degree of reduction possible and weight of gearing set.

Sir Charles Parsons, confronted with the same difficulty, believed the solution lay in eliminating as far as possible the inaccuracies which the teeth of all large gears revealed, and set to work to discover and eliminate their source, arriving eventually at the ingenious methods by which the errors in the master gear of the gear-cutting machine are distributed over the face of the cut gear. By this means a considerable improvement was effected in the working of reduction gears without interfering with the solidity of the pinion journal supports, but it is doubtful whether even absolute initial accuracy, could that be obtained, would in the long run give as good results as some system of automatic continuous self-adjustment; for initial gear-tooth errors are only one part of the derangements of alignments that have to be provided against—there are also the torque of the pinion, the gradual wear of the bearings, and the slight but material distortion of the gear from under varying loads.

A third way of approaching the problem has been undergoing development for some years past. It consists of building up the main gear with a series of discs, chambered at the sides, threaded upon second-motion shaft. When first put together these discs are in close contact both at the hubs and at the rims, and the built-up gear blank is turned end out just as though it was a solid gear, but when the cutting is finished a parting tool is run down between each pair of discs, so that the gear in its final working form appears as a row of discs secured rigidly to the shaft and to each other at their bosses, but separate at their peripheries. The teeth are, of course, cut helically, and the effect of the disc construction is that when in working undue pressure comes upon any disc at any point of its circumference the disc deflects sideways, and thereby allows the load to spread over the remainder of the discs.

The proportioning of the discs, particularly as regards strength and contour of cross-section, is obviously a matter calling for careful calculation and experiment in order that the lateral deflection may at no time involve fibre strains which could possibly cause destructive fatigue, but a very small side movement is sufficient to afford even distribution of load across the entire surface of the gear. This type of flexible disc has now been applied to some eighty sets of turbo-generators with uniform success and is at present undergoing trial as a turbine reduction gear for steamships.

HOME SOURCES OF OIL SUPPLY FOR BRITAIN

By Mark Meredith

TO a great manufacturing community any extension of resources for cheap lighting and motive power is a matter of primary importance, and when also there is the probability of a great new industry arising from the exploitation of a potential oil field in all parts where the geographical conditions permit, it is apparent that no stone should be left unturned to secure supplies of oil from all possible parts of the country. Already there is a big scheme in hand by the British Government, to ensure that proper arrangements will be made for the production of petroleum, and licenses will be granted for the purpose of exploiting all the oil fields in Britain on payment of a royalty of ninepence per ton, and the application for a license to the British Board of Trade. The scheme is the outcome of investigations by experts who have advised the Government that the petroleum deposits, long suspected by geologists to exist in certain strata in certain defined areas, are worth developing in view of the necessity of adding to Britain's fuel resources and thus lessening the need of importing large quantities of liquid fuel.

It is strange that much English money has been invested in recent years in the exploitation of foreign oil fields, whilst the evidences of petroleum deposits at home have been ignored or entirely overlooked. No country has been so bored as Britain, and yet, no country has, strictly speaking, been less tested in depth for oil. And it is just at a depth below the objective of the coal miner that petroleum in Great Britain must be looked for.

A Late Realization

The fact is, of course, that the presence of petroleum deposits in bulk and at economically accessible levels has not been sufficiently realized or comprehended and when England strikes oil in her own rocks, and finds her wonderful wealth in liquid fuel as well as in coal seams, the thanks will be due to those laborious investigators, like Dr. Forbes Leslie, and other leading members of the British Institution of Petroleum Technologists, who have devoted years of patient research to the subject and have at last secured public recognition.

Petroleum has "occurred" at Hemsworth, Dinington, Clowne, near Chesterfield and on the fringes of Lancashire. Years ago petroleum was discovered as far in the west as Leigh and Wigan and even at Ormskirk: it is to be found today at Market Rason and Donnington in Lincolnshire, and there is record in Derbyshire of oil being found at the Southgate colliery, where an intermit-

tent volume of petroleum, mixed with its own volume of water, flowed at a rate of from seventy to a hundred gallons daily. The rock from which it issued lies at a depth of no more than 320 yards from the surface. The most notable and most historic escape in Great Britain was that in the Riddings Colliery at Alfreton, exactly seventy years ago. The famous chemist, Lyon Playfair wrote one day to his friend James Young, then at work in Manchester, telling him of a petroleum spring having been discovered in his brother-in-law's colliery. The spring yielded as much as 300 gallons a day. Young bought up the yield and manufactured paraffin from it until the supply gave out, when he removed to Scotland, and commenced the development of the Scottish mineral shales.

More recently, a boring at Helham, near Newark, led to the discovery at a depth of 2,439 feet from the surface, of oilsands, 13 feet thick, believed by some observers to be only the upper sands of a productive series of unknown thicknesses. The bore had passed through coal measures into millstone grit, containing sand producing highly saline water, then fireclay, some shale, and then petroliferous sandstone. This boring has led experts to the conclusion that the eastern counties contain a large oil field, extending possibly along the Trent valley to the Derbyshire coalfields. The indications so far observed taken in conjunction with the relationship noted between the known oil escapes and underground formations point to the fact that the oil escapes cannot be erratic exudations from the shales on the surface, but must be outward and visible signs of vast deposits of petroleum retained in long buried structures.

Future Supplies

At the present time it is futile to speculate on the yield which may be looked for by the tapping of this great new oilfield. It may be years even under favorable circumstances, before the output could enable us to be independent of oil importations from overseas, but the possibilities will appeal to the least imaginative mind, and the developments that may follow will be watched with increasing interest. In the meantime it is worth noting that out of a total world production of marketed petroleum of 400 million barrels, the United States in the first year of war, supplied 265 million barrels. Russia was second with 67 millions, and Mexico third with 21 millions but while the American output is not keeping proportionately in advance of the demand in the home market alone, the Russian output is declining and has been long since before the war.

The world has still Rumania, Galicia, the Dutch East Indies, Japan, Peru, China, Egypt, Trinidad, India and Canada to look to for petroleum, but new sources are ever needed. It is quite time that the English oilfields were developed for all they are worth, as oil fuel will be required in vastly increased quantities after the war, and it is only self-protection for the home supplies to be developed, though no fear need be felt that the imported article will not be needed also.

STEEL CHIMNEY TROUBLES

By T. J.

CHIMNEYS built up of steel plates require protection both inside and outside, if they are to have reasonably long life and perform their work properly. The outside of a chimney is exposed to the action of sun, wind and rain, and the approved method of protecting it from rust is to give it a coat of good paint, which should be renewed whenever and wherever it shows signs of peeling off and exposing the metal to the influence of the elements. On the inside the chimney is exposed to the action of the gaseous products of combustion, which may have a temperature of several hundred degrees. Any form of paint would, therefore, be quite useless. Besides it must be remembered that the gases which flow up the chimney are derived from the combustion of fuels containing carbon, hydrogen, and sulphur, and, therefore, contain carbon dioxide, steam and sulphur dioxide. The steam in the chimney gases will condense if cooling takes place to any great extent, and the moisture will combine with the dioxides of carbon and sulphur to form carbonic acid and sulphurous acid. Both of these acids are corrosive in their action on iron, and they are particularly active in the presence of heat. Therefore, the inside of the chimney needs to be well protected.

The usual method of protecting the interior of a steel chimney is to line it with brick, which is laid up against the wall of the chimney. It is advisable to fill the interstices between the lining with a grout made of cement, as this will not only give support to the brickwork, but will at the same time prevent the corrosive acids from reaching the shell. Such a lining should extend to the top of the chimney to be effective. If it is carried up only half-way or even to two-thirds of the full height of the chimney the corrosion is localized at the part of the structure that it is most difficult to reach. The formation of moisture, due to condensation of vapor in the flue gases, will occur in the upper part of the chimney rather than in the lower, because the gases grow colder as they ascend, due to radiation from the shell of the chimney. It is, therefore, very advisable to carry the lining all the way up to the top.

It will be found upon observing steel chimneys that are in service that the signs of discoloration and corrosion on the outside are largely confined to the upper half of the structure. The rings or sections composing the chimney are put together in such a way that each overlaps on the outside of the ring below it, so that the edges of the circumferential seams face downward outside. This construction prevents rain and snow from collecting on the edges of the plates outside. On the inside, however, the edges face upwards, and if moisture is formed it will lodge on these edges, find its way through the joint and run down outside, streaking and discoloring the chimney. A continuous lining from the top to the bottom will lessen the radiation loss, reduce and perhaps eliminate condensation and in any case eliminate the moisture from the edge of the plates.

DOES A PISTON STOP AT REVERSAL?

By R. W. Miller.

HERE is an interesting question about which a controversy has arisen in connection with recent litigation. Put into its simplest form, the question is—does the piston of a steam engine stop when its direction is reversed, this is assuming that there is no lost motion in the parts?

Strange as it may seem, engineers, attorneys and examiners in the Patent Office disagree on the question. I maintain that it does not stop, but that the motion is continuous, and I would be interested if some reader of this publication can prove that I am wrong. To stop means to produce a state of rest—in other words, then, if the piston stops it must rest—then, how long does it rest?

The curve of a piston's motion, provided the connecting rod were of infinite length, would be truly harmonic. According to one authority, "a harmonic motion may be defined as the motion executed by the foot of a perpendicular let fall on the diameter of a circle from a point moving with uniform velocity along the circumference."

It is unnecessary to reproduce here a harmonic curve, because it is one with which we are all familiar. We know that no portion of this curve contains any part of a straight line. Now if there were a rest at each end of the stroke there would be two flat portions at each extreme of the travel parallel with the base line. One flatly contradicts the other.

One man argued that there was a point where there would be no motion; what becomes of this argument when we know that a point has no magnitude? Finally, if the piston stopped even for an infinitesimally small fraction of a second would not the flywheel to which it is connected stop also?

To controvert the theory that the flywheel stops, we find in the definition quoted that the point executing the harmonic motion must move with uniform velocity. How can the flywheel stop twice in one revolution, and yet have any point in its circumference move with uniform velocity?—the motion of the piston is just as continuous as the flywheel.

The Kerr Engine Co., of Walkerville, Ont., valve manufacturers, have leased their iron foundries to the Standard Foundry & Supply Co., who will hereafter make all the grey iron castings for the Kerr firm in connection with their extensive valve and hydrant business, and will also go strongly into jobbing work.

Standard Aviation Engine for American Aeroplanes

Very considerable importance is attached to the fact that United States engineers have designed a flying engine which is to be standard equipment for the Republic's air fleet. The manner of its conception, development and materialization was the subject of the following statement by Newton D. Baker, United States Secretary of War.

THE invention and rapid development of this engine is one of the really big accomplishments of the United States since its entry in the war. The engine was brought about through the co-operation of more than a score of engineers, who pooled their skill and trade secrets in the war emergency, working with the encouragement of the aircraft production board, the war department, and the bureau of standards.

The story of the production of this engine is a remarkable one. Probably the war has produced no greater single achievement. One of the first problems which confronted the war department and the aircraft production board after the declaration of hostilities was to produce quickly a dependable aviation motor. Two courses were open. One was to encourage manufacturers to develop their own types; the other to bring the best of all types together and develop a standard.

Inception of Standard Motor

The necessity for speed and quantity of production resulted in a choice of the latter course, and a standard motor became our engineering objective. Two of the best engineers in the country, who had never before seen each other, were brought together at Washington and the problem of producing an all-American engine at the earliest possible moment was presented to them. Their first conference, on June 3, lasted from afternoon until 2.30 o'clock in the morning. These two engineers were figuratively locked in a room in a Washington hotel and charged with the development of an airplane motor for use by American aviators over the battlefields of Europe. For five days neither man left the suite of rooms engaged for them. Consulting engineers and draftsmen from various sections of the country were brought to Washington to assist them. The work in the drafting room proceeded continuously, day and night. Each of the two engineers in immediate charge of motor development alternately worked a 24-hour shift.

An inspiring feature of this work was the aid rendered by consulting engineers and motor manufacturers, who gave up their trade secrets under the emergency of war needs. Realizing that the new design would be a Government design and no firm or individual would reap selfish benefit because of its making, the motor manufacturers, nevertheless, patriotically revealed their trade secrets and made available trade processes of great commercial value. These industries have also contributed the services of approximately 200 of their best draftsmen.

The two engineers locked together in a hotel room in this city promised the Government if given an opportunity they would design a satisfactory engine before a working model could be brought from Europe. A remarkable American engine was actually produced three weeks before any model could have been brought from Europe. It was promised that this engine would be developed before the Fourth of July. Twenty-eight days after the drawings were started the new engine was set up. This was on July 3. In order to have the engine in Washington and in actual running order at the nation's capital on Independence Day, the perfected engine was sent from a western city in a special express car. The journey was made in 21 hours, and four young men guarded the engine en route to Washington and personally attended to its transfer from one railroad to another.

Made in Many States

With the need for speed as an incentive, tools for building the first engine were made even before the drawings were finished—on the assumption that they would be correct. Parts of the first engine were turned out at 12 different factories, located all the way from Connecticut to California. When the parts were assembled the adjustment was perfect and the performance of the engine was wonderfully gratifying. This in itself demonstrates the capabilities of American factories when put to the test and when thoroughly organized for emergency work of this sort.

One of the chief rules outlined at the beginning of the designing work was that no engineer should be permitted to introduce construction which had not been tried out. There was no time for theorizing. The new engine is successful because it embodies the best thought of engineering experience to date. Not only did this country furnish ideas through celebrated consulting engineers, but the representatives in the United States of England, France, and Italy cooperated in the development of this motor.

Thirty days after the assembling of the first engine preliminary tests justified the Government in formally accepting the engine as the best aircraft engine produced in any country. The final tests confirmed our faith in the new motor in every degree. Both the flying and altitude tests of the new motor have been gratifying. One test was conducted at Pikes Peak, where the United States aviation engine performed satisfactorily at this high altitude. One of the engines, in an airplane, broke the American altitude record in a recent flying test.

While it is not deemed expedient to discuss in detail the performances and mechanics of the new motor, it may be said that standardization is a chief factor in the development of the Government's motor. Cylinders, pistons, and every other part of the motor have been standardized. They may be produced rapidly and economically by a great many factories operating under Government contracts. They may be as rapidly assembled, either by these plants or at a central assembly plant. The new engine amounts practically to an international model. It embodies the best there is in American engineering and the best features of European models so far as it has been possible to adapt the latter to American manufacturing methods.

A Cosmopolitan Model

The two engineers most directly connected with the production of the United States aviation engine had before them not only the blue prints and models of the most successful engines the war has produced, but also every available American suggestion. Men skilled in the invention of motors, both automobile and airplane, advised these engineers who were charged with the duty of providing rapidly and unerringly a motor which would embody every essential for wartime use. Non-essential complexities were consistently discarded by these engineers. The result was a composite design of maximum power, minimum weight, great speed capability, and adaptability to quick production.

The standardization of parts materially simplifies the problem of repair and maintenance. Spare parts will be promptly available at all times. Even the cylinders are designed separately. It is possible to build the new engine in four models, ranging from 4 to 12 cylinders, and under the standardization plan now worked out an 8-cylinder or a 12-cylinder model can be made, using the same standard cylinders, pistons, valves, cam shafts, and so on. This will make the question of repairs back of the lines a comparatively simple matter. The parts of wrecked 8-cylinder or 12-cylinder engines will be interchangeable, and a new engine may be assembled from the parts of wrecked machines.

The standardization of the new engine does not mean there will be no change in it during the war. There will be continuous experimentation as new types and improvements develop at the front and new ideas are born of the war emergency. If the engine can be improved, it will be improved; but as the motor stands to-day it is one of wonderful success and produced under dramatic circumstances. Construction of the new standard engine will not interfere with the continued manufacture of other serviceable models, either European or American, which existing plants are already turning out. The production of the United States motor will be carried on almost entirely in a new and expanding industrial field.

Raison D'etre

The Government is sometimes asked, "Why does not the United States adopt

one of the successful British or French high-powered machines and manufacture them?" British and French machines, as a rule, are not adapted to American manufacturing methods. They are highly specialized machines, requiring much hand-work from mechanics who are, in fact, artisans. It would require a year or more to teach American manufacturers and their mechanics to turn out such highly-specialized airplanes.

With the completion of final tests of the motor—tests which satisfied and gratified both expert engineers and army officers—progress already has been made toward organizing industry for the manufacture of the new machines, and deliveries will begin within a comparatively short time.

THE APPLICATION OF PULVERIZED COAL TO MALLEABLE MELTING FURNACES*

By Joseph Harrington, Chicago.

MELTING malleable iron with powdered coal as a fuel must still be considered in the experimental stage. The assurance that its advocates feel comes from an analysis of the requirements for melting and the definitely defined results that can be obtained with this fuel in securing controllable temperatures. In but one instance known to the writer has malleable iron been melted with powdered coal on a commercial scale, and this experiment was so brief that the only practical effect was to supply the observers with a fund of optimism and a feeling of certainty that had the work been continued, economical operation would have been effected. My analysis, therefore, must necessarily be more or less along the lines of theory, but I hope thereby to bring out in discussion such actual experiences as have been obtained, confirming or rejecting the theories advanced in this paper.

A Diversity of Opinion

In conversations with foundrymen I have developed a considerable diversity of opinion as to the temperatures which actually obtain in the malleable furnace. This experience does not differ in any way from that which one develops when the matter of high temperature in steam boiler furnaces is under discussion. It is not the simplest matter to determine temperatures above the range of the thermo-electric couple. Nominally at least, the metal couple can be utilized up to 2,400 degrees Fahr., but rapid deterioration takes place at these temperatures and the reading to a considerable degree is unreliable. The use of the radiation or optical pyrometer is also uncertain to a certain extent, because of the ease with which the instrument may be put out of adjustment and the care that must be exercised in focusing on a solid body without a gas screen to affect the intensity of radiation. When a good instrument is properly used the readings are correct, and the writer has developed temperatures in this manner up to 3,000 degrees. Under these conditions the amount of excess air supplied was cut down to near the limit, the carbon-dioxide resulting being about 16 per cent.

Temperature is also affected by the size and proportions of the furnace, so that a proper design will enable the engineer to secure temperatures which are sufficiently high and at the same time practical in the matter of brickwork maintenance.

The iron charge melts at various temperatures, ranging from 2,200 degrees to probably as high as 2,600 degrees, so that it is necessary to obtain at least the latter temperature for the prompt and economical production of fluid iron. This can easily be obtained with pulverized coal, especially if it is introduced as in a bunsen burner, which provides the elements in proper proportion within the fuel jet itself. The question of proper mixing of the fuel with the air for its combustion is absolutely vital, and in this process particular care must be taken that all of the elements are under control. Both the coal and the air must be introduced in such a manner that the character of the flame can be changed at will in accordance with the requirements of the charge at its various stages of heating and fusing.

Charge Should Be Heated Rapidly

During the early stages of heating, the charge is cold and should be brought up to melting temperature as soon as possible consistent with the proper soaking effect. The charge as a whole should come to its melting temperature with a reasonable degree of uniformity, so the various ingredients will not be melted at different times and enter the bath unmixed. The time element in this introductory period is one that affects the fuel economy only. The curve of temperature rise should be as steep as possible, because this is usually a period when the combustion is least complete and the loss consequently greatest. With powdered coal I venture to state the firing end of the furnace can be brought to a high heat within an hour, even though the furnace is cold to start with. With hand firing this period is often several hours long. Herein we see the first evidence of economy with this fuel.

The second period is one in which both fuel economy and effect on the charge are to be considered. After the iron reaches its melting point the charge begins to subside and becomes liquid. This is a period when it is almost probable the loss of the valuable ingredients in the iron takes place. We have present the necessary temperature in both the metal and the oxygen, together with an intimate mixture of the two which practically necessitates the oxidation of an appreciable percentage of carbon, manganese and silicon in the charge. Not only do these elements burn out, but other and less desirable elements may increase if the contact is unduly prolonged. The presence of sulphur in the furnace gases is one that has been commented upon in many different ways. Foundrymen almost always go to the expense and trouble of buying a special grade of coal which is low in sulphur on the theory that this harmful element should be kept as low as possible for the sake of its effect on the product. At the same time I have heard it emphatically stated that some of the best physical tests were obtained from iron which analyzed high in sulphur, so that it is not definitely defined in my own mind just what weight the amount of sulphur in the coal should have in such a discussion.

Not Like Other Fuels

In any event, as has been so clearly stated by Mr. Spring of the Crane Co., the burning out of certain elements may be serious and the melting of the charge should therefore be effected as rapidly as possible. The intense and sustained temperatures which can be produced with powdered coal would certainly lead to the belief that the desirable conditions for quick melting could readily be obtained. It must always be borne in mind that the fuel we have under discussion is nothing like solid fuel. We introduce the entire body of fuel directly into the chamber to be heated and at the same time it is of such a nature that the mixture is most intimate and the combustion most complete. Any proportion of air and fuel may be introduced, so that the character of the resultant flame may be nicely adjusted to the requirements of the melting process. This is in very sharp contrast to the average hand fired furnace wherein the blast has to be shut off periodically while the door is opened for firing. The production of heat during this time is suddenly lowered, and the temperature of the furnace correspondingly drops. After the fresh charge has begun to burn freely, the temperature mounts to a point slightly higher than before and about the time the fire is in its best condition, the blast is again shut off and the operation is repeated.

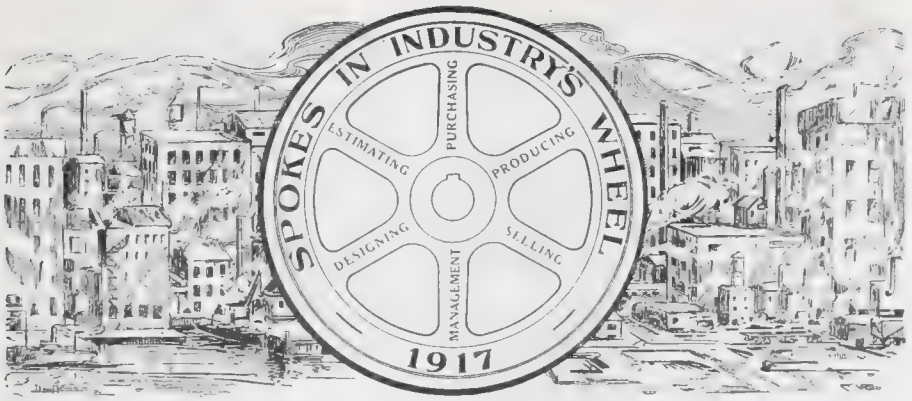
The temperature curve is therefore one of alternate risings and fallings, making it like a saw-tooth. This, of course, is not strictly the case with the relatively few natural draft furnaces, but the effect of the introduction of the fresh fuel is the same. The fire has to be continually raked, and the production of gas naturally varies. Not only does it vary, but it is under very little control, the only effect which the average furnaceman desires being the production of the required temperature. To this end he sacrifices everything else and under unfavorable conditions he may fire several hours just as hard as possible before the charge is properly heated.

More Hard Firing

After the iron has all liquefied and becomes covered with a layer of slag, further hard firing must be resorted to in order to produce a temperature high enough to render the iron sufficiently fluid for its purpose. With the iron thus protected from the effect of the furnace

(Continued on page 387.)

*A paper read at the annual meeting of the American Foundrymen's Association, at Boston, Sept., 1917.



The constitution of industrial enterprise is largely departmental—"spokes in a wheel." This series of articles has for its object the featuring in a racy, interesting and instructive fashion, the training, experience and achievement of those who to-day are transmitting, effectively, energy in their capacity as 'spokes in the wheels" of our metal-working establishments.

MELVILLE P. WHITE

SEVERAL important changes were recently made in the organization and management of the works of Canadian Allis-Chambers, Limited, Toronto. Mr. Melville P. White, manager of the Architectural, Bronze and Iron Works for the past 11 years, has had his jurisdiction extended to include also the management of the Davenport Works, under the title of Works Manager. Born in Woodstock, Ont., he served his indentures for architect with the well-known firm of Burke, Horwood & White, Toronto, and afterwards was associated in architecture with S. S. Beaman of Chicago. Leaving that firm, he remained eight years with the Chicago Ornamental Iron Co. In 1906 he returned to Toronto to become manager of the Architectural Bronze and Iron Works, which has since developed until it has become second to no plant of its kind on the continent.

MELVILLE P. WHITE.

THOMAS BATE

Mr. Thomas Bate, who has been appointed Mechanical Superintendent of the Davenport works of Canadian Allis-Chalmers, Limited, was born in Manchester, England, in 1877, educated at the Grammar School of that city, and apprenticed to the Sir Robert Peel, Soho Iron Works in 1891. Having studied applied mechanics and mechanical drawing and steam engineering under Prof. Jamieson, he came to Canada in 1893, and soon afterwards entered the service of the Canadian Pacific Railway, Delorimier Avenue shops as improver. After a short time in the shops of John Gillis & Co., Carleton Place, as improver on boat engines, he entered the service of the Canada Atlantic and Parry Sound Railway at Ottawa, in 1898 as journeyman machinist. In 1899 he was promoted to the position of locomotive foreman and shore engineer for the Canada Atlantic Railway and Transit Co. at Depot Harbor, Ont. In 1902 he re-entered the services of the Canadian Pacific Railway as locomotive foreman at White River, Ont., and was gradually promoted on Eastern and Western lines, until at the time of leaving that company, he had risen to the position of Assistant Works Manager, Angus Shops, Montreal.

THOMAS BATE.

As a testimonial of esteem, the staff and six thousand employees of the Angus Shops presented Mr. Bate with an illuminated address and a cabinet of silver and also a silver plated traveling club bag for himself, and a traveling case in French pearl for Mrs. Bate.

CANADIAN STEEL OUTLOOK

A MEETING of prominent manufacturers was held at Ottawa on Friday to discuss the serious situation that has developed because of the embargo on the export of steel products from the United States. War has increased the demand, both domestic and foreign, for steel products made in the United States. Munition and ordnance plants, shipyards and other industries in Britain and other allied countries, in Canada and in the United States are calling for supplies of ship and boiler plates, angles and other rolled forms used in vessel and other construction. To control the disposition of the output of these products, the United States has prohibited exportation except under license and has established a priority board, such as exists in Great Britain, to pronounce upon applications for such licenses. The list of articles covered by the proposition includes boiler tubes of iron and steel, chrome nickel steel, ferro-manganese, ferrosilicon, ferro-vanadium, iron and steel ship, boiler and tank plates one-eighth of an inch thick and heavier and wider than six inches, pig iron, scrap iron, scrap steel, spiegeleisen steel billets, steel blooms, steel ingots, steel bars, steel slabs, tin plate and tungsten.

The stocks of certain of these products for which Canada has depended upon the United States are stated to be running low. Hence manufacturers are faced with the necessity of considering the question of securing further supplies. Some of the articles included in the United States list are produced in Canada and some of them may be produced by extensions of existing plants. Ship plates and larger sizes of shapes and angles for shipbuilding and of structural steel are not made in Canada.

The steel manufacturers have, therefore, met to consider the situation and are taking steps to estimate their immediate requirements in the products, which cannot be freely exported from the United States, showing in detail, the quantities and the specific purpose for which the goods are required. These statements will be presented to Sir George Foster and the Trade and Commerce Department will forward them through the British Ambassador at Washington to the United States Priority Board with such backing as can be

given them. To what extent that body will satisfy Canadian demands cannot be predicted. There is a feeling that materials needed for war purposes, including the carrying out of the shipbuilding programme, may be granted in full. Consideration will be given next to the applications for materials for industries indirectly connected with war activities and for transportation, such as for building locomotives. Finally, the requirements of other industries will be taken up. Should the demands of industries of this class not be met the erection of bridges and large buildings might perhaps be retarded.

Those present at the conference were: F. C. T. Ohara, Deputy Minister of Trades and Commerce; P. L. Miller, of the Canadian Vickers Co., representing the shipbuilding industry; R. M. Davy, of the Dominion Bridge Co., D. D. Fraser, of the Montreal Locomotive Co.; R. Harmer, of the Sawyer-Massey Co., for the manufacturers of farm machinery; T. McC. Hutchinson, representing merchants handling plates for general trade; F. R. Humphage, Walkerville, for firms using high carbon and alloy steel; C. A. Waterous, of the Waterous Engine Co., for the builders of boilers, tanks, pulp and general machinery. In addition, representatives will be appointed for the car builders, railways and foundry men. Three representatives will get in touch with firms throughout Canada to learn their needs.

THE APPLICATION OF PULVERIZED COAL TO MALLEABLE MELTING FURNACES

(Continued from page 385.)

gases the presence of more or less oxygen is a matter of indifference so far as the iron itself is concerned. Under these conditions, with powdered coal the excess air can be proportioned to produce the most intense temperatures, and I do not hesitate to state that flame temperatures well in excess of 3,000 degrees may thus be created. A peculiar effect which accompanies a powdered coal flame in proper condition is the absence of the heavy rolling opaque flame which is so noticable under ordinary conditions. It was found after many experiments with fuel oil that the non-luminous flame was the hottest. This, of course, is similar to the gas flame of the bunsen burner as compared to the fish tail burner. With powdered coal the condition chemically is similar, but on account of this fuel having a high percentage of fixed carbon in it, absence of luminosity cannot be obtained. At the same time the extent of the flame can be controlled so that complete combustion will take place within five or six feet of the burner even when this burner is delivering 500 to 600 pounds of coal per hour. The effect of the direct contact of such a flame with any object is extremely destructive. It is possible to melt a clay fire-brick almost as readily as a piece of iron after it is placed in exactly the right relation to the jet. The point of most intense temperature is just about at the end of the flame, and one can readily appreciate the reason why a pile of iron must liquefy promptly when one considers that the flame temperature is perhaps as high as 3,500 to 4,000 degrees.

Effect on Furnace Lining

Another serious question which arises in this connection is the effect upon the refractory lining of the furnace. This should be divided into two parts for discusion. First, the effect on the brick of the temperature alone, and second, the fluxing effect due to the chemical action between the bath or the slag and the brick which forms the furnace walls.

So far as the first is concerned I would not consider that the deterioration of the refractories would be any greater than with ordinary methods of firing. In the first place the powdered coal jet does not impinge directly upon any brick work, and there need be, therefore, no blow pipe action whatsoever. The controllability of the flame is such that just the right furnace temperature may be secured and I do not believe it is a necessary consequence that the high temperature jet will result in any greater fusing of the brickwork than now obtains with the long continued hand firing. A good brick should be able to withstand 2,800 degrees indefinitely, and 3,000 degrees for moderate periods. I doubt if these temperatures are often reached in the malleable furnace.

The second consideration of the firing effect is more serious, but is one which I feel can be kept under control. The chemical analysis of furnace slag does not differ in quality from the analysis of ash from powdered coal. Ash analyses show a wide range in the percentages of the various ingredients, but seldom any great diversity in the ingredients themselves. These are the oxides of silicon, aluminum, iron, manganese and calcium, which corresponds to the elements appearing in the malleable furnace slag. The addition, therefore, of melted coal ash to the bath does not alter anything except the range of its chemical constituents. The effect on the furnace lining may be altered in case the addition of the coal ash should bring some one element greatly in excess of the others, but I can see no reason why the addition of these elements should make the character of the slag seriously different. It would even be possible to introduce a certain amount of lime for instance, should it be necessary to keep the slag basic. In fact almost any such element could be introduced with the coal and very intimately mixed with it, so that the resultant slag could be readily controlled, both as to chemical analysis and fluidity. I cannot but feel, therefore, that fears regarding the destruction of the furnace sidewalls are based on considerations which will disappear when the matter is more fully studied.

Less Carbon Burned Out

All the evidence which I have been able to obtain from the brief practical experience with this fuel in this service, is that there was an actual diminution in the burning out of carbon to the extent of some 2 to 5 per cent., rendering it necessary to decrease the amount of new pig in the charge to that extent in order that the character of the iron should be the same. This experience is much the same as that which has been accepted by steel manufacturers in their experience with this fuel in heating steel. With fuel oil in steel heating service, we find from 6 to 8 per cent. of excess oxygen in the gases, the actual oxidation of the iron due to the heating in the furnace being about 4 per cent. With powdered coal in the same furnace the amount of excess air is reduced to between 2 and 3 per cent., so that the amount of oxygen actually present in the furnace gases is less than one-half and the oxidation of the metal is substantially reduced. Observations indicate that this reduction may be as great as 50 per cent.

What is true when iron is only heated to rolling temperature should most certainly be true when actually melted, so that the grounds for believing in a reduction of oxidation are certainly good.

The situation commercially at this moment is rather peculiar. Almost without exception foundrymen will admit all of the foregoing, and the figures which I have prepared in a number of cases showing the probable savings, have remained undisputed. These savings are as much as 100% per annum, and yet the entire industry seems to be waiting for the other fellow to do it first. It is certainly a case where precedent is strong, and the reluctance of the foundrymen of this country to take the first step will probably be balanced by their eagerness to fall in line just as soon as the pioneer has completed his installation.

A SIMPLE method of filling up cracks in the water jackets of motor-car engines, which is often adopted in France, says a writer in the "Autocar," consists in making use of a liquid solution in which advantage is taken of the property possessed by copper salts to deposit their metallic contents when in contact with iron. To fill up a crack in a water jacket, all that is necessary is to fix the cylinder vertically in a bath or tank; plug up the lower water outlet in the jacket with a cork; then fill the jacket through the upper inlet with a sufficiently concentrated solution of sulphate of copper, which will at once commence to leak away through the crack or cracks and collect in the bath. The liquid should be scooped up as it collects and re-poured into the water jacket; the leakage will be quickly reduced to a slight "weeping" at the crack. When this weeping period has been reached, stop up the upper inlet with a cork in which a bicycle tire valve has been fitted, and by means of a tire inflater force air into the jacket. At first the degree of weeping will increase, but it will gradually disappear and become almost colorless instead of a bluey tint, the repair of the crack then being completed.

Annual Convention of American Foundrymen and Metal Men

The twenty-second meeting of the American Foundrymen's Association and the annual meeting of the American Institute of Metals were held conjointly in Boston, Sept. 24 to 28, and were marked by hospitality, patriotism and Entente sincerity which circumstances have not allowed full expression of in recent years. Active participation in the war imparted intense interest to the proceedings of two bodies whose active efforts are directly influencing the course of hostilities.

SEVERAL hundred delegates to the twenty-second annual meeting of the American Foundrymen's Association and the annual meeting of the American Institute of Metals were present at the joint opening meeting of the two organizations in Paul Revere Hall, Mechanics' Building, Boston, Sept. 24. A formal welcome on behalf of the city was extended to the visitors by Mayor Curley, the response of the visitors being made by R. A. Bull, of the Duquesne Steel Foundry Co., Coraopolis, Pa. J. P. Pero, president of the A.F.A., delivered his annual address and reviewed the work of the organization.

The major part of the convention period was spent by each organization in conventional manner, the meetings of the American Institute of Metals being held at the Hotel Somerset, with an occasional joint meeting at the quarters of the A.F.A. The application of the members' activities toward munition production was a feature of the non-ferrous topics. Following the usual entertainment features, the convention closed Sept. 28, the A.F.A. members adopting vigorous resolutions in support of the Government in carrying on the war against Germany, pledging their plant, efforts, and endorsement of the second Liberty loan. Officers elected on the closing day were: American Foundrymen's Association—President, Benjamin D. Fuller; vice-president, Stanley Flagg; secretary and treasurer, A. O. Backert. American Institute of Metals—President, W. M. Corse; senior vice-president, William B. Price; secretary and treasurer, F. L. Wolfe.

The exhibition of foundry equipment was held on the two floors of the Mechanics' pavilion, numerous moulding machines and sand-blast machines being in operation and providing the major attractions.

CONVENTION PAPERS, A.F.A.

General Topics and Foundry Costs

"The Foundry From the Viewpoint of the Sales Engineer," by H. R. Atwater, Osborn Mfg. Co., Cleveland.

"The Relationship of the Engineering Department to the Pattern Shop and Foundry," by F. J. McGrail, Struthers-Wells Co., Warren, Pa.

"How Character Analyses Solves the Man Problem," by William Judson Kibby, Cleveland.

Report of A.F.A. Committee Advisory to the U. S. Bureau of Standards, by Richard Moldenke, chairman, Watchung, N.J.

"Efficiency in the Foundry," by James A. Fitzgerald, Reno, Pa.

"Co-operative Shop Training," by W. B. Hunter, Fitchburg High School, Fitchburg, Mass.

Report of A.F.A. Committee on Classification of Technical Literature, by Richard Moldenke, Watchung, N.J.

"Facilities for Technical Training at Massachusetts Institute of Technology," by John Ritchie, Jr., Massachusetts Institute of Technology, Boston.

"Improving the Relationship Between Employer and Employee," by J. F. Kent, American Cast Iron Pipe Co., Birmingham, Ala.

Report of A.F.A. Committee on Safety, Sanitation and Fire Prevention, by Victor T. Noonan, chairman, Industrial Commission of Ohio, Columbus, O.

Report of A.F.A. Committee on Foundry Costs,, by B. D. Fuller, chairman, Westinghouse Electric & Mfg. Co., Cleveland.

Address on Cost Work of the American Foundrymen's Association, by C. E. Knoeppel, C. E. Knoeppel & Co., New York.

Report of A.F.A. Representatives on the Conference Board on Training of Apprentices, by Frank M. Leavitt, chairman, University of Chicago, Chicago.

Report of the A.F.A. Committee on Industrial Education, by Frank M. Leavitt, chairman, University of Chicago, Chicago.

MECHANICS' BUILDING, BOSTON, MASS., WHERE FOUNDRY EQUIPMENT WAS EXHIBITED.

Address, "The Labor Situation as Relating to Co-operation Between the Employer and Employee," by G. E. MacIlwain, Babson's Statistical Organization, Wellesley, Mass.

"Micro-Metallography for the Foundry," by Robert J. Anderson, Cleveland Metal Products Co., Cleveland.

Malleable Session

"The Theory of the Modern Waste-Heat Boiler and Possible Application of Such Boilers to the Malleable Melting Furnace," by A. D. Pratt, Babcock & Wilcox Co., New York.

"Application of Waste-Heat Boilers to the Malleable Melting Furnace," by C. D. Townsend, Danville Malleable Iron Co., Danvill, Ill.

"Application of Pulverized Coal to the Air Furnace," by Wr. R. Bean, Naugatuck Malleable Iron Works, Naugatuck, Conn.

"The Application of Pulverized Coal to Malleable Melting Furnaces," by Joseph Harrington, Chicago.

"How Malleable Iron Has Improved," by Enrique Touceda, Albany, N.Y.

"Troubles Encountered in Machining Malleable Iron: Causes and Remedies," by A. T. Jeffery, Dayton Malleable Iron Co., Dayton, O.

"Comparative Carbon Losses in Malleable Iron Annealing by Muffle and Pot Oven Methods," by Joseph B. Deisher, T. H. Symington Co., Rochester, N.Y.

"The Effect of Iron Oxide in Molding Sand," by W. R. Bean, Naugatuck Malleable Iron Works, Naugatuck, Conn.

Gray Iron Session

"Notes on Fine Molding Sands," by C. P. Karr, U. S. Bureau of Standards, Washington, D.C.

Report of A.F.A. Committee on General Specifications for Gray Iron Castings, by W. P. Putnam, chairman, Detroit Testing Laboratory, Detroit.

"Briquetting Foundry Borings," by A. L. Stillman, General Briquetting Co., New York.

"Cast Iron Shells in Permanent Molds," by Edgar Allen Custer, Philadelphia.

"The Seasoning of Gray Iron Castings," by L. M. Sherwin, Brown & Sharpe Mfg. Co., Providence, R.I.

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"Modern Centrifugal Cupola Blowers," by L. C. Loewenstein, General Electric Co., Schenectady, N.Y.

"The Effect of High Sulphur in Gray Iron Castings," by T. Mauland, International Harvester Co., Chicago.

Steel Session

"Molding and Casting Large Slag Pots," by C. J. McMahon, Illinois Steel Co., Chicago.

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"Steel Castings for Ordnance Construction," by Major C. M. Wesson, Watertown Arsenal, Watertown, Mass.

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"The Use of Vanadium in Steel Castings," by J. Lloyd Uhler, Union Steel Castings Co., Pittsburgh.

Report of A.F.A. Committee on Steel Foundry Standards, by W. A. Janssen, chairman, Davenport, Ia.

"Notes on An Electric Furnace Design," by John A. Crowley, John A. Crowley Co., Detroit.

"Recent Developments in the Application of the Electric Furnace to the Melting Problem," by Douglas Walker, Booth-Hall Co., Chicago.

"Comparison of Electric Furnace and Steel Converter for the Manufacture of Small Steel Castings," by C. R. Messinger, Sivyer Steel Castings Co., Milwaukee.

"The Electric Furnace From the Central Staion Standpoint," by E. L. Crosby, Detroit Edison Co., Detroit.

Final Professional and Business Session

"Solution of Foundry Transportation and Conveying Problems," by Robert E. Newcomb, Deane Works, Worthington Pump & Machinery Corp., Holyoke, Mass.

"Sand-Blasting in the Foundry," by H. L. Wadsworth, American Foundry Equipment Co., Cleveland.

"Experiments to Determine the Most Effective Means of Mixing and Blending Foundry Facing Sands," by R. Harrington, Hunt-Spiller Mfg. Corp., Boston.

"Oxy-Acetylene Welding and Cutting," by Stuart Plumley, Davis-Bournonville Co., Boston.

"Factors Contributing to the Economical Use of Grinding Wheels in the Foundry," by Wallace T. Montague, Norton Co., Worcester, Mass.

"Refractory Materials Employed in the Metallurgical Industries," by H. C. Arnold, University of Illinois, Urbana, Ill.

CONVENTION PAPERS, A.I.M.

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"Melting Yellow Brass in New Form of Induction Furnace," by G. H. Clamer, Ajax Metal Co., Philadelphia.

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"Negative Experiments on Waste Core Sand," by Dr. H. W. Gillett, U. S. Bureau of Mines. Ithaca, N.Y.

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"My Experience With Metal Melting Furnaces," by W. H. Parry, National Meter Co., Brooklyn, N.Y.

"The Briquetting of Nonferrous Light Metal Scrap," by A. L. Stillman, General Briquetting Co., New York.

Use of Nonferrous Metals for Munitions, Etc.

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"Stellite," by Elwood Haynes, Haynes Stellite Works, Kokomo, Ind.

"The Use of Die Castings in Munitions," by Charles Pack, Doehler Die Casting Co., Brooklyn, N.Y.

"Shrapnel Bullets," by Harold J. Roast, Jas. Robertson Co., Ltd., Montreal, P.Q.

"A Few Points on Alloy Patents," by Wm. J. Rich, Patent Office, Washington, D.C.

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"The Consumption of Copper and Its Varied Uses," by H. D. Hawks, United Metals Selling Co., New York.

Testing of Nonferrous Metals

"Comparative Tests on Test Bars and Actual Castings," by W. M. Corse, Titanium Bronze Co., Niagara Falls, N.Y.

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"Standard Test Bars of 88-8-4, Being the Result of Co-operative Work of Six Foundries; a New Series of Tests," by C. P. Karr, U. S. Bureau of Standards, Washington, D.C.

"The Expansion Coefficient of Alpha and Beta Brass" and "The Corrosion of Manganese Bronze Under Stress," by Dr. Paul D. Merica, Bureau of Standards, Washington, D.C.

Address by Richard C. Maclaurin, president, League to Enforce Peace.

"The School End of the Job in Training Foundrymen," by Dean C. B. Connelley, Carnegie Institute of Technology, Pittsburgh.

"The Flux and Cleaner Question of Brass," by E. D. Frohman, S. Obermayer Co., Pittsburgh.

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"Electrically-Heated Core Ovens," by Dr. C. F. Hirshfield, Edison Illuminating Co., Detroit.

"Brass Rolling Mill Alloys," by Roy A. Wood, Cheshire, Conn.

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"Antimony—Its Metallurgy and Uses,"

by K. C. Li, Wah Chang Mining & Smelting Co., Inc., New York.

"Development and Reabsorption of the Beta Constituent in Alloys Which are Normally of the Alpha Type," by Prof. C. H. Mathewson, Department of Mining and Metallurgy, Yale University, and Philip Davidson, New Haven, Conn.

"The Swelling of Zinc Base Die Castings," by H. M. Williams, National Cash Register Co., Dayton, O.

EFFICIENCY IN THE FOUNDRY*

By James A. Fitzgerald, Reno, Pa.

WHAT is efficiency; where does it start, and where does it end? Efficiency is the easiest and shortest route by which we may obtain a particular desired result. Its starting point is closely allied with a good cost accounting system and its end is unmeasurable.

We are informed by statistical reports that the failures in the business world run exceedingly high, and we naturally wonder why this is true. Upon investigation we find either a deplorably inefficient cost accounting system or gross inefficiency in the way the business is being conducted, due either directly to faulty cost accounting or to errors of the men in authority. In the latter case, failure comes because men do not take sufficient time to consider the vital factors which control the destiny of business. I sincerely believe that there is not a man living who at some period of his life has not had the amibition to go into business for himself and has enjoyed the promise of future success. Many have succeeded after years of struggle, and if one could induce these men to honestly relate their advancement to success, they would, without doubt, mention their method of cost accounting, its efficiency or inefficiency, and its results.

Business Warnings Are Unheeded

On the other hand, there are many failures of which we are uninformed, because we surround ourselves with the promise of a bright future, thus preventing us from heeding the warnings sounded by the mistakes of others. For this reason, a number of manufacturers approach near to the brink of business disaster before they learn the necessity of promptly making radical changes in order to repair the damage done by inefficiency and improper cost accounting.

Efficiency in the foundry does not always imply that efficient methods shall exist only in the foundry proper. On the contrary, efficiency must be applied in all departments. If efficient management exists all along the line, the foundry will reflect in a most desirable manner the effort that has been put forth by the men in charge.

A few years ago, whenever we had occasion to call on foundries, we generally found an ill-lighted, vile-smelling, dust-covered, dirty institution.

To-day, conditions are just the reverse. Why? Because in the old days very little scientific work along foundry lines had been accomplished. The foundryman kept no real record that he could refer to and find out where or at what point in the transaction of his business he had sustained a loss. The casting business was decidedly risky from a financial standpoint, or at least was considered as such. To-day we have well-lighted, ventilated and heated foundries, with all of the most modern and up-to-date conveniences. Moreover, our shops are scrupulously clean. Why have these changes come about? One foundryman will say competition brought them, and another will say we did it in order to better our financial standing. Others will present other reasons, and each of these has a certain bearing on these changes. However, the two great factors which have brought about the transformation in the foundry are system and science. With system we keep an accurate record or records of what is being done, and with science we determine beforehand what results we may reasonably expect before we spend our money. In the foundry, as in all other lines of business, we are dealing with natural laws which have been in force ever since the beginning of time. As long as we recognize these natural laws and keep within certain well-defined limits, we may anticipate results with the assurance of success.

*A paper read at the annual meeting of the American Foundrymen's Association, at Boston, Sept., 1917.

COMPARATIVE CARBON LOSSES IN MALLEABLE IRON ANNEALING BY MUFFLE AND POT OVEN METHODS*

By Joseph B. Deisher, Rochester, N.Y.

WE know that carbon in any ferrous metal must exist in the form of combined carbon or graphitic carbon or both. To go a step farther, we must admit that, after all, it is principally the proportion and condition of the carbon present which determines in what class we shall ultimately define such metal—that it, whether we shall call it wrought iron, steel, malleable iron, or gray iron. Therefore, it seems hardly necessary to state that the vital importance of carbon in malleable iron cannot be over-estimated. However, the limitation of my subject does not invite any prolonged discussion of this element except as it is affected by the annealing process.

Combined carbon represents a condition where practically all of the carbon present has, due to certain laws of metallurugy, gone into solid solution with iron, forming iron carbide, or, in malleable practice, what is generally known as hard iron. Had the greater part of the carbon not gone into solid solution, an ordinary gray iron casting would have been the result, representing a composition of free graphite, combined carbon and pure iron. Here, the carbon would largely exist as graphitic carbon. The former represents a proper composition for annealing, while the latter does not.

Then, we may consider that the annealing of malleable cast iron consists of heating a hard iron casting of the proper chemical composition to a degree of temperature where practically all of the iron carbide is dissolved from solid solution, without subsequent fusion, after which the casting is allowed to cool to handling temperature (150 to 300 degrees, Fahr.) under conditions that will permit the carbon to precipitate as minute graphite deposits in a texture of practically pure iron. In other words, the annealing process is simply a precipitation or conversion of carbon which had previously been driven into solid solution with iron; but, this conversion is most always accompanied by a loss of carbon, and it is this removal of carbon that later on we are to discuss.

As briefly outlined herein, the annealing process seems very simple; yet, there are many conditions that may interfere with the perfect conversion of the carbon, some of which we will discuss in the following order: Hard iron composition; annealing temperatures; time required to dissolve iron carbide; rate of cooling; and removal of carbon.

Hard Iron Composition

In the first place, the analyses of the hard iron composition must, of course, come within certain specified or ratio limits; else, the iron carbide will not completely dissolve under ordinary annealing temperatures. To establish these limits is not the purpose of this paper. For the sake of brevity, we must assume that they are known. However, it might be appropriate here to state that a hard iron composition figured on the silicon alone is no better than guess work, so far as obtaining uniform physical results in the annealed product is concerned. In fact, the most uniform results can obtain only where we know with some degree of accuracy the total carbon content in the hard iron; and such knowledge is not readily available without the total carbon analyses of the pig iron, which, due to its high and variable carbon content, determines the percentage of the various grades of scrap material that can be carried in the melting mixture. The blast furnace people are reluctant to furnish or guarantee the carbon analyses of pig iron, which is a matter of such vital importance to the successful production of high-grade malleable iron castings that I hope it will merit thorough investigation by a competent committee.

Annealing Temperatures

In the matter of annealing temperatures for malleable cast iron, much depends upon the chemical composition of the hard iron. Ordinarily, the iron carbide commences to be slightly affected after the temperature has reached approximately 1,250 degrees Fahr., but the chemical union forming the carbide is not greatly weakened until a temperature of at least 1,400 degrees is reached. In fact, it is, for many reasons, desirable to run the temperature considerably

*A paper read at the annual meeting of the American Foundrymen's Association, at Boston, Sept., 1917.

higher than 1,400 degrees; and, therefore, below is given a table showing what may be considered safe maximum and annealing temperatures for both pot and muffle type ovens:

	Maximum Deg. Fahr.	Minimum Deg. Fahr.
Pot oven	1650	1450
Muffle oven	1700	1500

Exhaustive tests have shown that prolonged annealing has no detrimental effect upon the physical strength of the product, unless the temperature is run too high, in which case troubles too numerous to mention may result. Prolonged or repeated annealing at high temperatures will, however, have a growing tendency to produce a pearlite rim, which seriously interferes with any machining operation; but, the unreasonable length of time required to produce the rim, under normal annealing conditions, eliminates this as a disturbing factor. Therefore, it would seem only reasonable to assert that when malleable cast iron is seriously over-annealed it is usually because the temperature has been run too high rather than too long. However, on the other hand, it is, I believe, also a safe assertion to state that so far as annealing is concerned more poor-grade malleable cast iron is produced as the result of under-annealing than over-annealing. If the above temperature limits are adhered to and good results do not obtain, the trouble is not directly due to annealing temperatures.

Heat distribution sometimes brings up a troublesome problem, the difficulty being to reach the minimum temperature at the coolest point in the oven without exceeding the maximum temperature at the hottest point. This is largely a matter of oven design; and, unless any two points in the oven can be held within the limits herein prescribed, there is something radically wrong with the oven or the manner in which the burden is arranged. The trouble mught be that the flues are not clean.

Time Required to Dissolve Iron Carbide

For reasons not generally understood, it has been found necessary to hold castings at annealing temperature from 60 to 72 hours before the cooling process is commenced. Otherwise, the result will almost invariably show that the iron carbide has not been completely dissolved; that is, the annealed casting will show that a portion of the carbon remains in solid solution, as combined carbon, causing a brittle, inferior product.

It would seem that the chemical union forming the solid solution of carbon in iron is not thoroughly dissolved immediately the annealing temperature has been reached, or, if the iron carbide is completely dissolved in less than 60 hours, we have yet to discover the means of preventing a portion of the carbon from re-combining when the casting is cooled to handling temperature. Then, assuming, for the sake of argument, that it has been found necessary to hold the castings at annealing temperature for 60 hours, three questions arise which should invite interesting discussion, namely:

1.—Are 60 hours actually required to dissolve the iron carbide?

2.—Does the iron carbide dissolve in less than 60 hours, the balance of the allotted time being required for precipitation of graphite carbon?

3.—Does the precipitation of graphite carbon immediately follow the gradual dissolution of the iron carbide, requiring 60 hours to complete the conversion process?

I should answer the first question negatively. It is my opinion that dissolution of the iron carbide is very largely a matter of heat penetration, particularly where the muffle type oven is used. In the pot oven, there is little doubt but that the nature and composition of the packing material affects the dissolution of the iron carbide, which assumption is in part at least borne out by the fact that malleable annealing can be successfully conducted with this type of oven at approximately 50 degrees lower temperature than is required in the muffle oven. This does not necessarily mean that the temperature at which the iron carbide is affected in the pot oven is lower than in the muffle oven. In the pot oven, after say 1,400 degrees temperature is reached, it would seem that the effect of the oxide packing material tends to hasten the dissolution of the carbide at a lower ultimate temperature than is required in the muffle oven. In other words, I believe that by skilful manipulation of oven temperatures, the iron carbide can be dissolved in less than 60 hours after annealing temperature has been reached.

In regard to the second question, I am inclined to believe that the iron carbide can be dissolved in less than 60 hours, and that it is the obstinate or lagging precipitation of graphite carbon, at the usual annealing temperature, that delays the conversion process, under present practice. Then, assuming that such is the case, the question arises as to the state of the carbon between dissolution and precipitation. In my opinion, after the annealing temperature has thoroughly penetrated the entire body of the hard iron casting, the chemical union forming the iron carbide is so weakened that the rate of cooling determines whether the carbon will remain in solid solution as combined carbon or precipitate as graphite carbon. In other words, after dissolution of the iron carbide, I believe that the carbon exists in a semi-soluble state, from which it will precipitate as graphite if cooled under proper conditions.

It is doubtless unanimously agreed that the third question covers in a general way about what really happens. In fact, practical tests have shown that where test wedges were removed from the oven at regular intervals before 60 hours had elapsed after the annealing temperature was reached, combined carbon was almost invariably found to exist in direct proportion to the length of time the wedges were held at or above annealing temperature. However, in my mind, this does not prove conclusively that 60 hours are actually required to completely dissolve the iron carbide. On the other hand, I am inclined to think that in the test wedges just referred to the annealing temperature had not completely and uniformly penetrated the entire body of the metal and also in removing the wedges from the oven before the regular period for annealing was completed the cooling was too rapid. In other words, had the annealing temperature been as high as the castings would stand at the commencing of the anneal and the wedges that were withdrawn before the 60 hours of annealing had been completed, cooled very slowly, the results would doubtless have shown that a greater percentage of the carbon had precipitated as graphite.

In this connection, I recall an incident where by accident the arch forming a muffle chamber in a muffle type oven fell in and the fire had to be shut off about 36 hours before the regular time. The stack damper and the oven were sealed up practically air-tight and allowed to cool down as slowly as possible, with the result that when the oven was opened the castings were found to be fairly well annealed. The carbide appeared to be completely broken up, but there was scarcely a trace of decarbonization visible without the aid of a microscope. This condition I attribute to the fact that the annealing temperature was high when the accident occurred and the cooling was extremely slow, allowing plenty of time for the precipitation of graphite. It might also be of interest to know that the castings were not scaled. Professor Touceda has done some very enlightening research work along this line, but it has occurred to me that some of the conclusions he has arrived at in regard to the length of time required to break up the iron carbide, may, after further experiments, be altered by the effect of higher initial annealing temperature and slower rate of cooling. It should be thoroughly understood that I take no exception to the conclusions he has reached, based upon the experiments as they were made.

We must realize that one of the greatest drawbacks to the malleable industry is that it takes too long to anneal the castings. While my experience in malleable annealing has not gone far enough to justify any revolutionary results, there is no doubt whatever in my minds, but that the time required under present practice for this operation can be very materially reduced. To that end, if the presentation of this paper stimulates discussion and exchange of opinion regarding the points brought up, its purpose will have been accomplished.

Rate of Cooling

Aside from the absolute necessity of first completely dissolving the iron carbide, the rate of cooling is, in my estimation, of the utmost importance, particularly where it is desired to complete the annealing process in the shortest time possible.

It is generally considered that the sooner the castings can be brought to annealing temperature, the better; but the same rule does not hold true in the

matter of cooling to atmospheric temperature, after the annealing temperature has been reached and held for the required time. After the iron carbide is dissolved, the object then is to cool the oven under such conditions as will prevent recombining of the carbon. If cooled too fast, all the carbon will not precipitate as graphite.

Practical tests have shown that the recalescence point in cooling malleable cast iron from annealing temperature is slightly under 1,400 degrees. Plotted cooling curves have shown that at this temperature there is an abnormal liberation of heat from some source, presumably the result of rapid precipitation of carbon, first as graphite, then as carbon monoxide and carbon dioxide gas, depending upon the amount of oxygen present; hence, the ultimate removal of a portion of the carbon, as will be mentioned later on in this paper. Therefore, we will establish 1,390 degrees as the critical point in annealing at which graphite will precipitate with most repidity.

It is held by some authorities that, after the iron carbide is completely dissolved, the castings should be held at or slightly above the critical point in cooling for several hours in order that the precipitation of graphite carbon may be more complete, the theory being that graphite carbon will precipitate with more rapidity the nearer the critical point just referred to is approached. Contrary to such theory, it is the practice of some foundrymen to run the temperature to the highest point just before the fire is shut off; then seal up the oven and, as they express it, "allow the castings to soak." To my mind, such practice is quite the reverse of what it should be. In other words, I am inclined to believe that the nearer the temperature of 1,400 is reached in cooling, the more favorable become conditions for the precipitation of graphite carbon, providing, of course, the temperature has previously reached the point where all iron carbide was dissolved. Therefore, it would seem the better practice to reach the highest temperature at the beginning of the anneal, such temperature to be held until the iron carbide is dissolved; then, gradually drop to 1,400 degrees, a temperature which some believe will better favor the precipitation of graphite carbon. This would also lessen the danger of warping. In fact, I would not be at all surprised that, when the temperature is run high at the end of the anneal, some of the carbon is, due to being more nearly soluble in iron and lack of time in cooling, forced back into solid solution as combined carbon which would otherwise have precipitated as graphite had the temperature not been run so high just before the cooling process was commenced. In some cases, where the sulphur-manganese ratio may not be properly balanced in the hard iron composition, such practice is also much more apt to produce a pearlite rim or "picture-frame" fracture, a source of extreme annoyance where the castings have to be machined. However, this condition is rarely, if ever, produced by annealing alone, except where the annealing is prolonged almost indefinitely or the temperature run entirely too high.

A point which might have been mentioned in connection with establishing the critical point in cooling is that, while approximately 1,390 degrees represents the point in temperature at which graphite carbon precipitates with most rapidity (assuming, of course, that the iron carbide has been dissolved by subsequent heating at higher temperature), it does not necessarily follow that the precipitation of graphite ceases immediately the temperature drops below 1,390 degrees. In fact, the precipitation of graphite carbon, in some cases, may continue until the temperature drops to 1,242 degrees, below which temperature all precipitation is arrested. Therefore, in reality, 1,242 degrees is the critical point for dissolution of the iron carbide; or, in other words, this is the temperature at which the chemical union forming the carbide commences to weaken upon heating and is also the point at which the precipitation of graphite carbon ceases upon cooling. Malleable iron annealing could not be successfully conducted at either 1,390 or 1,242 degrees temperature, if at all, due to the length of time that would be required to dissolve the iron carbide; and, therefore, these temperatures are extremely important only in the matter of cooling the castings from annealing to handling temperature.

As to the effect of further cooling between the temperature of 1,242 degrees and handling temperature of the castings, this, I believe, depends solely upon the condition of the carbon when the temperature of 1,242 degrees in cooling is passed. Where combined carbon is present, the effect of the rate of cooling upon that part of the structure representing the carbide would be about parallel to the tempering of a piece of soft steel of the same carbon content, heated and cooled under similar conditions. In other words, the more rapid the cooling, the harder would become the crystallization of the carbide and consequently the more brittle the casting; and, vice-versa. Were all the carbon in graphitic form at 1,242 degrees temperature, the cooling might be forced to handling temperature without detriment to the physical characteristics of the metal. This is based upon the theory that iron and free carbon are not readily, if at all, soluble at 1,242 degrees Fahr.; therefore, the formation of iron carbide is impossible, and where there is not combined carbon present in ferrous metal it can usually be hardened very little by tempering. As a practical test, a well annealed malleable test wedge was heated in a handforge to a cherry red and quenched in cold water, without the slightest effect upon the ductility of the metal or condition of the carbon. Then, a duplicate wedge was heated to a slightly higher temperature and cooled under the same conditions, with the result that the carbon was re-combined and the metal very brittle, showing a steely, white fracture. In the first test the critical point was not reached where the iron and free graphite were soluble; and, as practically no carbide was present to commence with, the metal was not hardened to any noticeable extent by tempering. In the second test it would seem that the tem perature was reached where the free graphite became dissolved in iron and by sudden cooling through the critical range was forced into solid solution as combined carbon, which composition was still further hardened by tempering.

The point which I wish to make clear is that where conditions have been ideal for conversion of the carbon, more liberty can be taken in cooling the castings from 1,242 degrees Fahr. to handling temperature, thus saving considerable time at present allowed for gradual cooling through the same range of temperature.

Removal of Carbon

It is possible to accomplish the conversion or annealing process without removing any carbon whatever; but, as this is neither practical nor desirable, it will not be discussed. The removal of carbon is entirely the result of oxidation; and, where no oxygen is present, no carbon can be removed. Oxygen for the removal of carbon in malleable iron annealing is supplied usually by an oxide packing material or by air, depending upon the type of annealing oven used.

For years it was thought that malleable iron annealing could not be accomplished unless the hard iron castings were packed in iron-oxide scale; but, as the tonnage of the industry rapidly increased, this packing material became harder to obtain, with the result that today most any kind of refractory material is used in the place of iron-oxide scale, and with comparatively good results. Some plants have even gone so far as to adopt the muffle-type oven, where no packing material at all is used. The castings are simply stacked up in the oven and protected from contact with the flame by muffled chambers or by covering with sheet-iron plates and sand or scale. Practically the only difference in the results obtained is that more carbon is removed from the casting where a strong oxide packing material is used, as will be shown later on in this paper.

While decarbonization or the removal of carbon in the anneal is in most cases desirable, some, I am afraid, are disposed to over-estimate its importance. In other words, it is the complete conversion rather than the removal of carbon in the anneal that determines the malleability of the product. It is a well-known fact that the higher the total carbon content in malleable cast iron (even though the conversion in the anneal be perfect), the lower will be its ultimate strength, the strength being affected in direct proportion to the minute cavities made necessary for graphite deposits in the ferrite structure. Even so, it does not necessarily follow, by any means, that the removal of carbon in the anneal is absolutely essential to the production of high-grade malleable iron. While at least a small amount of carbon will always be removed in the anneal, the total amount of carbon should be regulated in the white iron—a fact which cannot be

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PROGRESS IN NEW EQUIPMENT

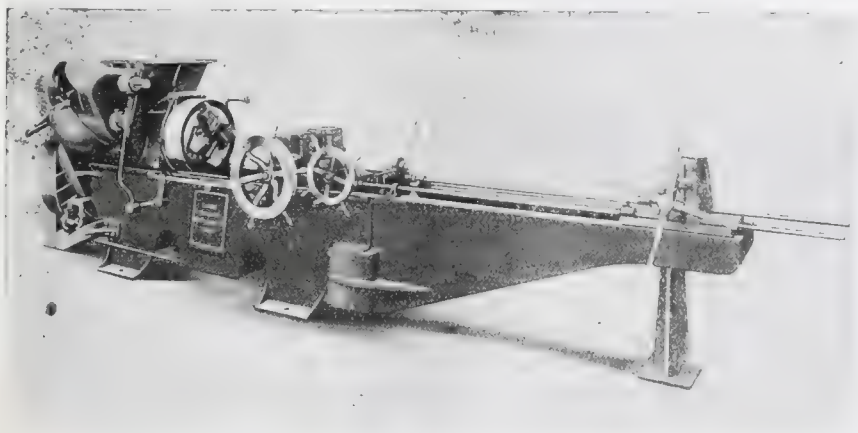
A Record of New and Improved Machinery and Accessories for the Machine, Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

STAY ROD THREADING MACHINE

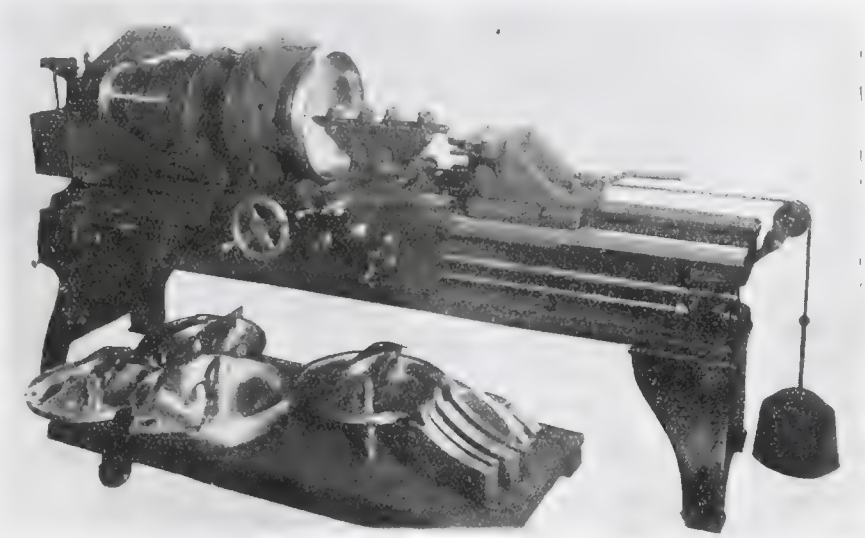
THE illustration below shows a Landis Threading Machine which was designed and built for a large shipbuilding plant for threading hollow staybolt tubes. The tubes vary from six to eight feet in length and from 2¾ in. to 3½ in. dia. The machine is equipped with an auxiliary bed which is attached to the main bed of the machine. This extension bed supports an auxiliary carriage fitted with threaded grips employed in timing the threads on the ends of the tubes and also in supporting the tubes. The machine is furnished with a leadscrew attachment which insures a high degree of accuracy and a perfect start of the thread, also a pitch indicator which shows the correct position for engaging the leadscrew nut. The illustration shows the machine arranged for an A. C. Constant Speed motor with mechanical speed change box and silent chain and sprocket drive, the photograph being taken prior to mounting the motor in position.

The method of threading the hollow staybolt tubes on this machine is as follows: Thread one end of all the tubes which are to be threaded, by gripping them in the vise of the regular carriage. Then take a master tube which has both ends threaded and with threads continuous. Place the master tube in the machine, close down the chasers in the threaded portion on one end, that is, make the grooves or serrated surfaces of the chasers fit in the threads already cut on the master stay tube. Grip the other end of the master tube with the threaded grips in the auxiliary carriage. These grips should be sufficiently loose so that they can adjust themselves endwise with the thread on the master tube. After the master tube is gripped in the extension carriage these threaded grips should be securely gripped in the auxiliary carriage vise jaws. Then throw in the leadscrew nut of the main carriage and grip the tubes in the regular vise of the main carriage. The chasers, the leadscrew and the threads on the staybolt tubes then will be all timed. Remove the master stay tube and place the tubes which have already been threaded on one end in the threaded grips of the auxiliary carriage and engage the leadscrew nut when the pitch indicator on the main carriage shows the correct position for engaging this nut. The operation of threading, the second end on all the tubes can then proceed and the threads on both ends of the tube will then be continuous.

The machine employs the Landis All-Steel Rotary Die Head and long life chasers which insure a high production of accurate threads.



STAY ROD THREADING MACHINE.



LATHE FOR MACHINING TORPEDO AIR FLASK HEADS.

LATHE FOR MACHINING TORPEDO AIR FLASK HEADS

THE increasing urgency attendant on the production of war supplies of all descriptions continues to influence the efforts of machine tool builders in modifying previous designs in use, and the lathe shown in the accompanying engraving illustrates a recent effort to simplify the work of machining air flask heads for torpedoes, the method employed being believed to be entirely new.

Formerly all of these heads used to be turned on a standard lathe, and the different radii on the various surfaces was obtained by various radius attachments. Since the inside of one head has at one time from two to five different curves, it was necessary to use ten different adjustments on the radius attachment in order to complete one head on both sides. Contrary to this, a standard lathe is now used, modified in various respects. Instead of using the radius attachment, there is a form attachment on the tail stock, and in some instances a forming attachment on both the carriage and tail stock.

The upper part of the tail stock has been removed, and a special attachment made for it. This special tail stock carries the form of the surface of the head to be machined. The tool post has a straight slot, longitudinally across. One side of the slot carries the cutting tool, and the other side carries the forming guide. The tool, as well as the forming guide, has on its cutting edge, or guiding edge, a true circle of, for instance, ¼ of an inch, as sketch shows. The distance of the centre of the circles between the cutting tool and the guiding tool is, therefore, to the extent of the width of the tool apart; which in this particular

case is about ¾ of an inch between the two centres.

The forming plate is marked "centre of tool" and "centre of work," and these two centres are about ¾ of an inch apart, so as to register correctly. On account of the fact that it is necessary to use a circular cutting edge, so as to be able to follow all around the form and go into the recesses, the condition arises that the form plate has not the same form as the finished torpedo head. If, for instance, the head is 16 in. radius on a certain face of the torpedo head, the radius on the form for this torpedo head will not be 16 in., since the cutting tool does not always cut on the same point, but changes around the circular form of the tool. Therefore, the builders have to develop each form plate according to the head for which it was made.

Some of these torpedo heads have a very decided transverse curve, ending in a longitudinal curve. In order to make the machine operate correctly it is necessary to disconnect the tool post screw and connect same with thet feed of the carriage, so that when one feed is thrown out, the other feed is thrown in without any interrup-

This has been accomplished by splitting the screw operating the tool post and connecting this attachment with the clutch on the carriage, which operates the feed screw of the carriage, thus making the machine practically automatic. For boring the centre of the torpedo head the machine is equipped with a progressive boring tool, which is registered by the guide in the centre of the form.

The heads are gauged by inserting a plug gauge into the centre of the head. The inside form of the head is registered from this plug gauge by means of a flat gauge. The outside form is gauged by another flat gauge, which rests on the upper surface of the inner gauge, which consequently not only gauges the inside and outside form, but also the thickness of the head, which otherwise would offer serious difficulties.

By means of this machine it is possible to machine a smaller head of about 12 in. in diameter within about six hours, and the larger head of about 22 in. diam eter within ten to fourteen hours. These figures are taken from samples made of cast iron by the builders of the machine, the Luster-Jordan Co., Norristown, Pa.

UNIVERSAL CUTTER AND TOOL GRINDER

TWO designs of cutter grinders, designated No. 1 and No. 2 respectively, are being marketed by the Grand Rapids Grinding Machine Co., the former shown in the accompanying engraving being adapted for cutter and tool grinding only, while the larger machine is equipped for drill grinding in addition.

The machine illustrated has a capacity between centres of 9½ in. dia. by 20 in. long, while face milling cutters can be handled up to 12 in. dia. The spindle is of crucible steel with ground journals running in ring-oiled phosphor-bronze bearings with convenient means for adjusting to compensate for both radial wear and end play.

The longitudinal table travel is occasionally more conveniently operated by a lever instead of the usual handwheel, and an auxiliary lever which can be instantly mounted or taken off is shown on the machine. The table proper can be swiveled through 360 degrees, and is supported by the sub-table, a king bolt of liberal size and central turntable being provided. Both vertical and cross movements screws are made with Acme threads working in bronze nuts, grad uated dials reading to thousandths of an inch, indicating the movement in each case. Longitudinal travel is obtained

UNIVERSAL CUTTER AND TOOL GRINDER

by steel rack and pinion, which, combined with the lever handle, enables short, quick strokes to be taken in the manner which is so desirable in sharpening most milling cutters.

The standard equipment furnished includes 3 in. 3-jaw geared scroll chuck, fitted with shank, plate and pulley, universal vise, internal grinding attachment with belt and driving pulley, seven grinding wheels, three wrenches, two spring lip tooth rests, with blocks, base and bars, dogs, driving pin and countershaft complete. The net weight of the No. 1 machine is 525 lbs., and of the No. 2. Machine, 665 lbs.

COMPARATIVE CARBON LOSSES

(Continued from page 392.)

too forcibly impressed upon those who desire to maintain a high-grade product.

While possibly somewhat foreign to my subject, the statement just made again emphasizes the importance of knowing the carbon content of the pig iron entering into the mixture when charged into the melting furnace, inasmuch as the color method for making preliminary carbon tests, as used in steel practice, cannot be employed by the malleable melter, because the total carbon in hard iron is so much higher than in steel. Unless the total carbon can be regulated with some degree of accuracy more than guess-work in the melting mixture, the hard iron will not be of such consistency that we can reasonably expect uniform results to obtain in the anneal, regardless of the type of oven or annealing practice employed. Therefore, I again call to the attention of the association a most valuable service which can be performed for its malleable members by setting into motion some plan for a united request or demand upon pig iron dealers to furnish and guarantee the total carbon analyses, as well as the various elements which it is their present practice to supply.

To further emphasize the importance of regulating the total carbon in the hard iron, I can state as an absolute fact that the best malleable cast iron never results from a hard iron composition in which the total carbon is around 3.00 per cent., regardless of the amount of carbon removed in the anneal. However, in this connection, caution should be used not to run the carbon too low, else trouble will result from other sources. If the total carbon is allowed to go below 2.20 per cent. in the hard iron, the iron carbide will not dissolve under ordinary annealing temperatures, which is only one of the numerous troubles that will result from running the carbon too low.

In another part of this paper the statement is made that prolonged annealing will have no detrimental effect upon the physical strength of malleable cast iron, unless the temperature is run too high; also, that the removal of carbon in the anneal is not essential to the production of high-grade malleable iron. These statements are best corroborated by a series of practical tests conducted by Prof. Touceda, to whose liberal generosity I am indebted for many favors. In one of these tests eight test wedges were poured from the same ladle of iron and annealed in such a manner that one of the wedges was annealed eight times, one seven times, and so on down the line until one of the wedges received only one anneal. Physical tests showed that there was practically no difference in ductility between the wedge annealed once and the one annealed eight times; and, after each successive anneal, the physical test showed but very little comparative variation in strength. Upon analytical examination, however, it was found that the total carbon was diminished by each successive anneal — the first anneal showing a total carbon

THE EXHIBIT OF THE CANADIAN S K F CO. AT THE NATIONAL EXHIBITION DISPLAYED THE SELF-ALIGNING FEATURES OF THEIR BEARING IN AN EFFECTIVE MANNER.

of 1.40 per cent., while the eighth anneal showed that only 0.22 per cent. of carbon remained. The test showed conclusively that the consistent removal of carbon in each successive anneal did not improve the quality of the product; and, at the same time, it demonstrated that prolonged or re-annealing, under normal conditions, will not affect the strength of the metal.

Muffle Oven Versus Pot Oven

There are two types of oven generally used for annealing malleable cast iron; namely, the muffle oven and the pot oven, either of which has its particular advantages and disadvantages. The typical muffle oven is in reality an oven built within an oven, that is, the construction of the outside oven, or oven proper, is very similar to the pot oven, except that it encloses two small arches, separated by a partition, which form the muffle chambers in which the castings are placed for annealing. When filled with castings, the muffle chambers are sealed up as nearly air-tight as possible. The fire-box is arranged usually at the rear end of the oven in such a manner that the flame passes directly over the arches of the muffle, returning through specially constructed flues in either side-wall and underneath the floor to the main stack flue at the back end of the oven directly underneath the fire-box. There is, of course, a damper in the base of the stack for regulating the distribution of heat throughout the oven, which is a simple matter if the flues are kept clean.

In regard to the pot oven, I take it that all present are familiar with the general design of this type of oven and that a brief description is unnecessary. It is nothing more or less than the muffle oven, minus the muffle chambers.

The principal advantages in favor of the muffle type oven are the elimination of labor required to pack, handle and shake out the pots, cost of packing material, expense of renewing pots, etc. Among the objections to the muffle oven may be noted the following:

1.—On acount of the heat having to penetrate the brick arch forming the muffle chamber, it requires somewhat longer to bring the castings to annealing temperature.

2.—Not being supported by packing material, the castings are more apt to become warped or contorted.

3.—There is more danger of the castings becoming scaled, due to air leaking into the muffle.

4.—Small and delicately constructed castings cannot be annealed in this type of oven unless they are packed in trays.

The muffle-type oven is particularly adapted to annealing medium and heavy castings, where packing material is not necessary to prevent warping and where a small amount of scale on the castings is not a serious objection. For this class of work the muffle type oven has everything in its favor.

The pot oven is used by some foundrymen probably because they have never tried any other method of annealing; by others, because the nature of their work requires that the castings be annealed in packing. There is no doubt but that the pot anneal produces a cleaner and better casting for machining or nickel-plating, but so far as physical strength is concerned, the pot oven has no particular advantage over the muffle oven. Of course, the principal objection to the pot oven is the expense and inconvenience of packing the casting in pots However, where light and intricate castings are to be annealed, I can suggest no alternative.

Practical Tests

For the purpose of further proving certain statements made in this paper, I have had cast from the same ladle of iron a set of 30 test wedges and 30 tensile test bars. These were annealed in three lots of 10 wedges and 10 tensile bars each. Two lots of these tests were annealed in a pot oven, one lot being packed in mild packing material and one lot in strong packing material. The mild packing material was mill scale mixed with coke breeze; the strong packing material was iron-oxide scale. The third lot of tests was annealed in a muffle type oven, without packing material. The comparative results are shown in the accompanying table.

Total carbon in hard iron was determined from hard iron shot, cast in water. The carbon determinations after anneal were made from drillings taken entirely through the butt end of test wedges. The test wedge was 6 inches long, 1 inch wide, ½ in. thick at butt and tapered to wedge point. The tensile test bars were round, ⅝ in. in diameter. Each of the above tests represents the average for 10 bars, five of them being annealed near the roof and five near the floor of the oven, about midway between front and back end.

Unfortunately, the heat from which the above tests were poured was too high in both carbon and manganese to produce an extremely ductile and tough material. However, it accomplished the purpose for which the tests were made.

By reference to the tabulated results, it will be noted that the mild packing material removed less carbon than the strong packing, and that more combined carbon remained in the iron annealed in mild packing, which strengthens the statement that in addition to removing more carbon the oxide packing material has a tendency to hasten the dissolution of the carbide after annealing temperature has been reached. I would also call attention to the fact that, while the muffle-type oven removed less carbon than the oxide packing material in the pot oven did, the conversion of carbon in the muffle oven was more nearly complete. This, in conjunction with the results of the physical tests, proves that it is the conversion rather than the removal of carbon in the anneal that produces ductility.

In closing, I wish to express my appreciation of services rendered to the writer by the Eastern Malleable Iron Co., in whose laboratory some of the tests herein referred to were made.

COMPARATIVE RESULTS OF POT OVEN AND MUFFLE OVEN ANNEALING.

	POT OVEN		MUFFLE OVEN
	Mild Packing	Strong Packing	Without Packing
Total carbon in hard iron (per cent.)	2.63	2.63	2.63
Combined carbon after anneal (per cent.)	0.53	0.13	0.05
Graphitic carbon after anneal (per cent.)	1.75	1.85	2.12
Total carbon after anneal (per cent.)	2.28	1.98	2.17
Total carbon removed in anneal (per cent.)	0.35	0.65	0.46
Wedge test (length of butt in inches)	2⅞	2⅞	2
Tensile strength (pounds per square inch)	49,448	50,044	49,542
Elastic limit (pounds per square inch)	38,746	37,1[illegible]	[illegible]
Elongation (per cent. in 2 inches)	6.3	6.7	7.3

NAYTHUR OF THEM

"As I was crossing the bridge the other day," said an Irishman, "I met Pat O'Brien. 'O'Brien,' says I, 'how are you?' 'Pretty well, thank you, Brady,' says he. 'Brady,' says I, 'that's not my name.' 'Faith,' says he 'and mine's not O'Brien.'

"With that we again looked at each other, an' sure enough it was naythur of us."

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STANDARDIZATION, ITS POSSIBILITIES AND PROBABILITIES

CURRENT events continue to afford evidence that the theory of standardization carried to a logical and common sense extent will be the saving grace of the world, industrially, and in a sense militarily, not only during the stress of present conditions, but for an indefinitely long period in the future.

When the question of standardized ships was first mooted, it was viewed in the light of an emergency measure only and its future development was not accepted offhand as a definite probability of any great magnitude, but the putting into commission of the first British ship of this description has been the occasion for an expression of expert and authoritative opinion which leaves no doubt as to the possible developments of the theory. Not that the theory is new, or that its present application is on such a scale that its success could have been seriously questioned. The real point at issue was whether the individualism of British shipbuilders and shipowners could be completely put aside under stress of national necessity and every available effort put forth toward producing a need of the moment.

The answer to all the critics, for and against the policy was afforded on August 30, on which day the authorities in Britain announced their satisfaction with the initial production. Every yard, the Shipping Controller stated, was full of standardized ships, and while the first of the fleet had been built in practically five months, it was expected that similar vessels would be turned out in four or four and a half months. One personage stated that while quicker immediate results, in some cases at least, might have been obtained by a repetition of customary designs, for such a purpose as the authorities had in view, standardization held the field, as obviously it made possible standardization of ship material which would not be possible if shipowners were merely repeating their usual designs.

The success attending the British materialization of the standard ship idea lends further interest to the United States' efforts which are now being put forth, and likewise draws attention to the work being executed throughout the Dominion. In our case, as in that of Britain, detailed reference to localities and builders is not possible at this time, but the particulars of ships' engines published in this issue are evidence that "something" is being accomplished. There is nothing spectacular or mysterious about design, materials or workmanship. These factors are all made to meet the case, but the mere fact that they are being made, in numbers more or less imposing, is further evidence of the inroads which standardization is making on engineering fields hitherto almost exempt.

A third proof of the possibilities of the idea, especially when developed in receptive soil, is afforded by the official announcement regarding the design of aeroplane motor achieved under the auspices of the United States war department. The detailed procedure as outlined by Secretary Baker has produced actual results of the most gratifying nature. In magnitude of operation, and directness of influence on the struggle, it measures well up to the shipbuilding schemes of both nations, but the circumstances attending the inception and development of the idea, and the degree of success attained, mark a standard of engineering accomplishment both in design and manufacture which in the normal course of events is not ever likely to be duplicated.

It must not be supposed, however, that such developments foretell the possibility of the great majority of manufacturing efforts being reduced to a plane of repetition. As a matter of fact, all past evidence seems to indicate that one result has been an increasing keenness of competition, more alertness for improved production methods, wider and more systematic search for new materials, and an all round effort to give more value for money received.

The classic instance of such industrial development is the automobile. The adoption of standard dimensions, materials and types has had no apparent restrictive effect on the initiative energy of designers. Changes in external appearance are largely a matter of fashion, but back of all there continues a steady effort at research, design improvement, and productive efficiency which has made the industry a standard of international comparison in most industrial discussions.

The lesson of the motor car has its bearings on all the other vital questions of the moment. Standardization has had no more debasing effects on it than the standard keyboard has had on pianos and typewriters. Ships' dimensions and scantlings are ripe for such treatment, and the idea expressed in many handbooks that every ship is an experiment has been disproved absolutely and for all time. Capacity, speed, power and efficiency are calculated with an amazing degree of accuracy, and if the various kinds of cargo, specialized and miscellaneous, are duly allowed for, there seems no insurmountable reason why ships, both freight and passenger, were not standardized long ago, the same as railroad equipment.

THE STEEL EMBARGO

WIDESPREAD apprehension has been created in all branches of metal-working plants through the action of the United States Government in restricting the export of steel and iron products which are absolutely essential to the welfare of this country, and which in their ultimate influence thereon, contribute in no small measure to Canada's ability to continue her participation in the war on a scale commensurate with her dignity and past efforts.

While awaiting the result of official negotiations with every belief in their ultimate and rapid success, it is at least pertinent to suggest to the United States officials responsible for the measure, that its effect both materially and morally on their Allies, the people of Canada, at this time, would be much more detrimental than the stream of trouble notes, objections and representations which were the order of the day when our big neighbor was in the neutral class. Now that she is with us and for us, legislation of this type should be at least consistent, not irritant, whatever the ulterior motives.

INDUSTRIAL NOTABILITIES

GEORGE DOUGLAS MacKINNON, B.A., Sc., vice-president and general manager, MacKinnon, Holme & Co., Ltd., Sherbrooke, Que.; vice-president and general manager, MacKinnon Steel Co., Ltd., was born in Charlottetown, P.E.I., June 8, 1874, son of Alexander and Grace (Douglas) MacKinnon.

He received his education at Prince of Wales' College, Charlottetown, and McGill University, and on graduating from the latter institution in mechanical

GEORGE DOUGLAS MACKINNON, B.A.Sc.

engineering in 1897, became instructor in manual training Acadia University, Wolfville, N.S., 1897-1898. Following this he engaged in engineering work in Canada and United States, including heavy forging, steel and iron casting and general machine work in connection with army and navy equipments, munitions and marine engine construction with Midvale Steel Co., Philadelphia; with A. R. Holmes, organized MacKinnon, Holmes Co., Ltd., 1909, for general structural and steel plate work, and has also executed shell forging contracts.

Mr. MacKinnon is a member of Canadian Manufacturers' Association, and his society affiliations include: A.F. & A.M.; I.O.F.; I.O.O.F.; Canadian Society of Civil Engineers.

He married Mary Louise Bowman, of La Colle, Que., in 1892, and has four daughters. In politics Mr. MacKinnon is Independent, and in religion Scotch Presbyterian. His residence is Drummond Street, Sherbrooke, Que.

Photo, Courtesy British & Colonial Press.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	$46 95
Lake Superior, charcoal, Chicago	58 00
Standard low phos., Philadelphia	87 00
Bessemer, Pittsburgh	37 25
Basic, Valley furnace	33 00

	Montreal	Toronto
Hamilton	.....	.....
Victoria	.....	60 00

FINISHED IRON AND STEEL.

Per lb. to Large Buyers.	Cents
Iron bars, base, Toronto	5 25
Steel bars, base, Toronto	5 50
Steel bars, 2 in. to 4 in. base	6 00
Steel bars, 4 in. and larger base	7 00
Iron bars, base, Montreal	5 25
Steel bars, base, Montreal	5 50
Reinforcing bars, base	5 25
Steel hoops	7 50
Refined iron	5 50
Norway iron	11 00
Tire steel	5 50
Spring steel	7 00
Band steel, No. 10 gauge	5 75
Chequered floor plate, 3-16 in.	15 20
Chequered floor plate, ¼ in.	15 00
Staybolt iron	8 50
Bessemer rails, heavy, at mill	38 00
Steel bars, Pittsburgh	4 00
Tank plates, Pittsburgh	8 00
Structural shapes, Pittsburgh	4 00
Steel hoops, Pittsburgh	5 75
F.O.B., Toronto Warehouse.	
Steel bars	5 50
Small shapes	5 75
F.O.B. Chicago Warehouse	
Steel bars	5 00
Structural shapes	5 00
Plates	8 00

FREIGHT RATES.

Pittsburgh to Following Points	Per 100 lbs. C.L.	L.C.L.
Montreal	23.1	31.5
St. John, N.B.	35.1	45.5
Halifax	35.1	45.5
Toronto	18.9	22.1
Guelph	18.9	22.1
London	18.9	22.1
Windsor	18.9	22.1
Winnipeg	64.9	85.1

METALS.

	Montreal	Toronto
Lake copper	$31 00	$32 00
Electro copper	31 00	32 00
Castings, copper	30 00	31 00
Tin	63 00	63 00
Spelter	10 50	10 50
Lead	11 00	11 00
Antimony	18 00	19 00
Aluminum	65 00	62 00

Prices per 100 lbs.

PLATES.

	Montreal	Toronto
Plates, ¼ to ½	$12 00	$13 00
Heads	12 30	13 30
Tank plates, 3-16 in.	12 65	13 25

WROUGHT PIPE.

Effective July 5, 1917.

Size.	Black Per 100 feet	Galvanized Per 100 feet
Standard Buttweld.		
⅛ in.	$ 5 00	$ 6 50
¼ and ⅜ in.	5 12	7 16
½ in.	6 46	8 03
¾ in.	8 17	10 29
1 in.	12 07	15 22
1¼ in.	16 83	20 59
1½ in.	19 53	24 61
2 in.	26 27	33 12
2½ in.	42 12	52 94
3 in.	55 08	69 23
3½ in.	69 92	86 94
4 in.	82 84	103 00
Standard Lapweld.		
2 in.	29 23	35 71
2½ in.	43 88	54 11
3 in.	57 38	70 76
3½ in.	71 76	89 70
4 in.	85 02	106 28
4½ in.	96 52	121 29
5 in.	112 50	141 34
6 in.	145 90	183 36
7 in.	190 40	238 00
8 L in.	200 00	250 00
8 in.	230 40	288 00
9 in.	276 00	345 00
10 L in.	256 00	320 00
10 in.	329 60	412 00

Prices—Ontario, Quebec and Maritime Provinces.

WROUGHT NIPPLES.

4" and under, 45%.
4½" and larger, 40%.
4" and under, running thread, 25%.
Standard couplings, 4" and under, 35%.
4½" and larger, 15%.

OLD MATERIAL.

Dealers' Buying Prices.

	Montreal	Toronto
Copper, light	$19 00	$18 00
Copper, crucible	21 00	20 50
Copper, heavy	21 00	20 50
Copper wire	21 00	20 50
No. 1 machine composition	20 00	18 00
New brass cuttings	16 00	17 00
No. 1 brass turnings	14 00	15 75
Light brass	12 00	10 00
Medium brass	16 00	14 00
Heavy brass	16 00	16 00
Heavy melting steel	21 00	17 00
Steel turning	12 00	8 00
Shell turnings	12 00	12 00
Boiler plate	22 00	18 00
Axles, wrought iron	30 00	24 00
Rails	25 00	18 00
No. 1 machine cast iron	25 00	25 00
Malleable scrap	20 00	20 00
Pipe, wrought	10 00	9 00
Car wheels, iron	26 00	25 00
Steel axles	29 00	30 00
Mach. shop turn'gs.	8 50	8 50
Cast borings	12 00	8 50
Stove plate	19 00	19 00
Scrap zinc	6 50	6 50
Heavy lead	10 00	9 00
Tea lead	7 00	7 00
Aluminum	30 00	25 00

BOLTS, NUTS AND SCREWS.

	Per Cent.
Carriage bolts, ⅜" and less.	10
Carriage bolts 7-16 and up.	net
Coach and lag screws	25
Stove bolts	55
Plate washers	List plus 10
Machine bolts, 7-16 and over	net
Machine bolts, ⅜ and less.	10
Blank bolts	net
Bolt ends	net
Elevator bolts	50 and 5
Machine screws, fl. and rd. hd., steel	27½
Machine screws, o. and fil hd., steel	10
Machine screws, fl. and rd. hd., brass	add 20
Machine screws, o. and fil. hd., brass	add 25
Nuts, square blank	add $1 50
Nuts, square, tapped	add 1 75
Nuts, hex. blank	add 1 75
Nuts, hex. tapped	add 2 00
Copper rivets and burrs, list plus	30
Burrs only list plus	50
Iron rivets and burrs	17½
Boiler rivets, base ¾ in and larger	$7 60
Structural rivets, as above	7 50
Wood screws, flat, bright	72½
Wood screws, O. & R., bright	67½
Wood screws, flat, brass	37½
Wood screws, O. & R., brass	32½
Wood screws, flat, bronze	27½
Wood screws, O. & R. bronze	25

MILLED PRODUCTS.

	Per cent.
Set screws	35
Sq. & Hex. Head Cap Screws	30
Rd. & Fil Head Cap Screws	10
Flat ⅞ But. Hd. Cap Screws plus	10
Fin. & Semi-fin. nuts up to 1 in.	35
Fin. and semi-fin. nuts, over 1 in., up to 1½ in.	30
Fin. and semi-fin. nuts, over 1½ in., up to 2 in.	10
Studs	20
Taper pins	40
Coupling bolts, plus	10
Planer head bolts, without fillet, list plus	10
Planer head bolts, with fillet, list plus 10 and	10
Planer head bolt nuts, same as finished nuts.	
Planer bolt washers	net
Hollow set screws	list plus 20
Collar screws	list plus 30, 10
Thumb screws	20
Thumb nuts	65
Patch bolts	add 40, 10
Cold pressed nuts to 1½ in.	add $4.50
Cold pressed nuts over 1½ in.	add $7.00

BILLETS.

	Per gross ton
Bessemer billets	$ 60 00
Open-hearth billets	60 00
O.H. sheet bars	70 00
Forging billets	90 00
Wire rods	85 00

F.o.b. Pittsburgh.

NAILS AND SPIKES.

Wire nails	5 50	5 45
Cut nails	5 70	5 80
Miscellaneous wire nails		60%
Spikes, ⅜ in. and larger		7 50
Spikes, ¼ and 5-16 in.		8 00

MISCELLANEOUS.

Solder, strictly	0 36
Solder, guaranteed	0 38½
Babbitt metals	18 to 70
Soldering coppers, lb.	0 53
Lead wool, per lb.	0 16
Putty, 100-lb. drum	4 75
White lead, pure, cwt.	18 00
Red dry lead, 100 lb. kegs, per cwt.	15 45
Glue English	0 38
Tarred slaters' paper, roll	0 95
Gasoline, per gal., bulk	0 31½
Benzine, per gal., bulk	0 30½
Pure turpentine, single bbls., gal	0 69
Linseed oil, raw, single, bbls.	1 49
Linseed oil, boiled, single bbls.	1 52
Plaster of Paris, per bbl.	2 50
Sandpaper, B. & A.	list plus 20
Emery Cloth	list plus 33 1-3
Borax, cyrstal	15
Sal Soda	0 03½
Sulphur, rolls	0 05
Sulphur, commercial	0 04½
Rosin "D," per lb.	0 03
Rosin "G," per lb.	0 03½
Borax crystal and granular	0 15
Wood alcohol, per gallon	2 15
Whiting, plain, per 100 lbs.	2 20

ROPE AND PACKINGS

Plumbers' oakum, per lb.	.09
Packing, square braided	.34
Packing, No. 1 Italian	.40
Packing, No. 2 Italian	.32
Pure Manila rope	.39
British Manila Rope	.33
New Zealand Hemp	.33
Transmission rope, Manila	.45
Drilling cables, Manila	.41
Cotton Rope, ¼-in. and up	.47

POLISHED DRILL ROD.

Discount off list, Montreal and Toronto 25%

CARBON DRILLS AND REAMERS.

	Per Cent.
S.S. drills, wire sizes up to 52	40
S.S. drills, wire sizes, No. 53 to 80	25
Standard drills to 1½ in.	40
Standard drills, over 1½ in.	15
3-fluted drills, plus	10
Jobbers' and letter sizes	40
Bit stock	40
Ratchet drills	15
S.S. drills for wood	40
Wood boring brace drills	25
Electricians' bits	30
Sockets	40
Sleeves	40
Taper pin reamers	20
Drills and countersinks	list plus 30
Bridge reamers	45
Centre reamers	10
Chucking reamers	10
Hand reamers	15

COLD ROLLED SHAFTING.

At mill ..... list plus 40%
At warehouse ..... list plus 50%

Discounts off new list. Warehouse price at Montreal and Toronto.

IRON PIPE FITTINGS.

Canadian malleable, A, add 7½%; B and C, 10%; cast iron, 35%; standard bushings, 25%; headers, 60; flanged unions, 40; malleable bushings, 25 and 7½; nipples, 55; malleable lipped unions, 50.

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28	$11 00	$11 00
Sheets, black, No. 10	12 00	12 00
Canada plates, dull, 52 sheets	12 00	12 00
Canada plates, all bright	12 50	12 50
Apollo brand, 10¾ oz. galvanized	12 25	12 09
Queen's Head, 28 B. W.G	11 75	10 75
Fleur-de-Lis, 28 B.W. G.	11 75	10 75
Gorbal's Best, No. 28	12 00	10 25
Colborne Crown, No. 28	11 25	10 00
Premier, No. 28 U.S.	13 75	11 70
Premier, 10¾ oz.	13 85	12 00
Zinc sheets	20 00	20 00

PROOF COIL CHAIN.

B	
¼ in.	$12 00
5-16 in.	11 50
⅜ in.	11 15
7-16 in.	10 90
½ in.	10 70
9-16 in.	10 70
⅝ in.	10 50
¾ in.	10 40
@ in.	10 25
1 inch	10 10
Extra for B.B. Chain	1 20
Extra for B.B.B. Chain	1 80

ELECTRIC WELD COIL CHAIN B.B.

⅛ in.	$15 50
3-16 in.	11 70
¼ in.	8 40
5-16 in.	7 40
⅜ in.	6 35
7-16 in.	6 35
½ in.	6 35
⅝ in.	6 35
¾ in.	6 35

Prices per 100 lbs.

FILES AND RASPS.

	Per Cent.
Great Western, American	50
Kearney & Foot, Arcade	50
J. Barton Smith, Eagle	50
McClelland, Globe	50
Whitman & Barnes	50
Black Diamond	40
Delta Files	37½
Nicholson	40
P.H. and Imperial	50
Globe	50
Vulcan	50
Disston	50

COAL AND COKE.

Solvay Foundry Coke	$
Connelsville Foundry Coke	
Steam Lump Coal	
Best Slack	

Net ton f.o.b. Toronto

BOILER TUBES.

Size.	Seamless	Lap-welded
1 in.	$36 00	$ ....
1¼ in.	40 00	....
1½ in.	43 00	36 00
1¾ in.	43 00	36 00
2 in.	50 00	36 00
2¼ in.	53 00	38 00
2½ in.	55 00	42 00
3 in.	64 00	50 00
3½ in.	....	58 00
3½ in.	77 00	60 00
4 in.	90 00	75 00

Prices per 100 feet, Montreal and Toronto.

OILS AND COMPOUNDS.

Castor oil, per lb.	40
Royalite, per gal., bulk	16
Palacine	19
Machine oil, per gal.	26½
Black oil, per gal.	15
Cylinder oil, Capital	45½
Cylinder oil, Acme	36½
Standard cutting compound, per lb.	0 06
Lard oil, per gal.	2 50
Union thread cutting oil antiseptic	88
Acme cutting oil, antiseptic	37½
Imperial quenching oil	39½
Petroleum fuel oil	12½

BELTING—NO. 1 OAK TANNED.

Extra heavy, single and double	30-5%
Standard	40%
Cut leather lacing, No. 1	1 95
Leather in sides	1 75

TAPES.

Chesterman Metallic, 50 ft.	$2 00
Lufkin Metallic, 603, 50 ft.	2 00
Admiral Steel Tape, 50 ft.	2 75
Admiral Steel Tape, 100 ft.	4 45
Major Jun. Steel Tape, 50 ft.	3 50
Rival Steel Tape, 50 ft.	2 75
Rival Steel Tape, 100 ft.	4 45
Reliable Jun. Steel Tape, 50 ft.	3 50

WASTE.

White	Cents per lb.
XXX Extra	20
Peerless	20
Grand	19
Superior	19
X L C R	18
Atlas	18
X Empire	18
Ideal	17
X press	16

COLORED.

Lion	14½
Standard	13
No. 1	13
Popular	11¾
Keen	10½

WOOL PACKING.

Arrow	25
Axle	20
Anvil	15
Anchor	11

WASHED WIPERS.

Select White	12
Mixed colored	10
Dark colored	09

This list subject to trade discount for quantity.

RUBBER BELTING.

Standard	40%
Best grades	20%

ANODES.

Nickel	.50 to .54
Cobalt	1.75 to 2.00
Copper	.44 to .46
Tin	.49 to .56
Zinc	.23 to .25

Prices Per Lb.

COPPER PRODUCTS.

	Montreal	Toronto
Bars, ½ to 2 in.	55 00	53 00
Copper wire, list plus 10.		
Plain sheets, 14 oz., 14x28 in., 14x60 in.	55 00	53 50
Copper sheet, tinned, 14x60, 14 oz.	60 00	54 25
Copper sheet, planished, 14x60 base.	64 00	60 00
Braziers', in sheets, 6x4 base	55 00	52 00

BRASS.

Brass rods, base ½ in to 1 in rd.	0 55
Brass sheets, 8 in. wide, 20 oz.	0 60
Brass tubing, seamless	0 57
Copper tubing, seamless	0 58

PLATING SUPPLIES.

Polishing wheels, felt.	3 00
Polishing wheels, bullneck	1 75
Emery in kegs, American	06
Pumice, ground	05
Emery glue	15 to 20
Tripoli composition	04 to 06
Crocus composition	07 to 08
Emery composition	08 to 09
Rouge, silver	35 to 50
Rouge, powder	30 to 35

Prices Per Lb.

LEAD SHEETS.

	Montreal	Toronto
Sheets, 3 lbs. sq. ft.	$18 00	$18 00
Sheets, 3½ lbs. sq. ft.	18 00	18 00
Sheets, 4 to 6 lbs. sq. ft.	17 50	17 50

Cut sheets, ½c per lb. extra.

Cut sheets to size, 1c per lb extra.

PLATING CHEMICALS.

Acid, boracic	$ .15
Acid, hydrochloric	.05
Acid, hydrofluoric	.14½
Acid, nitric	.10
Acid, sulphuric	05
Ammonia, aqua	08
Ammonium carbonate	.15
Ammonium chloride	.11
Ammonium hydrosulphuret	.40
Ammonium sulphate	.07
Arsenic, white	.19
Copper, carbonate, anhy.	.35
Copper, sulphate	.17
Cobalt sulphate	.70
Iron perchloride	.20
Lead acetate	.16
Nickel ammonium sulphate	.12
Nickel carbonate	.35
Nickel sulphate	.15
Potassium carbonate	.75
Potassium sulphide (substitute)	.20
Silver chloride (per oz.)	.65
Silver nitrate (per oz.)	.65
Sodium bisulphite	.10
Sodium carbonate crystals	05
Sodium cyanide, 127-130%	.41
Sodium hydrate	.04
Sodium hyposulphite, per 100 lbs.	5.00
Sodium phosphate	.14
Tin chloride	.60
Zinc chloride	.60
Zinc sulphate	.09

Prices Per Lb. Unless Otherwise Stated.

The General Market Condition and Tendency

THE assurance that further shell contracts will be placed in Canada will create a more optimistic feeling in engineering circles, for at one time it was thought that the end had come to munitions orders. Steps are being taken to relieve the acute situation caused by the embargo on steel products. There will be no difficulty in obtaining export licenses on steel required for agricultural implements, railways or shipbuilding. The materials coming in for these purposes will consist principally of steel plates, boiler tubes and ship sections. There have been no changes in steel prices in Canada and it appears likely that prices will remain practically stationary for some time. The market is very unsettled and outlook continues obscure, so it is impossible to say definitely what will develop. There is an impression in the trade, however, that the embargo will tend to stiffen the market. The situation in regard to pig-iron is much the same as for steel and prices of domestic iron are still unchanged. The fact that mills and furnaces are booked up for some considerable time will prevent any material decline in prices in the meantime. The fixing of copper prices has not affected the local situation, due partly to the scarcity of red metal caused by the embargo. There is also very little spot copper to be had. Lead has declined but otherwise prices are unchanged. The scrap metal market continues more or less stagnant. Prices of scrap lead, zinc and aluminum have declined. Prices of Manila and hemp ropes have advanced, but white lead is down. The machine tool market has been fairly active this week.

Montreal, Que., Oct. 1, 1917.—Local interest is centred on the recent developments that have taken place in the States in connection with the fixing of prices on certain classes of steel and metals. This action may eventually solve a problem that has promised to become very perplexing, but as far as present conditions are concerned it would appear that the general situation is just as unsettled as ever. The question more than any other that concerns the Canadian buyer is to what extent he will benefit by the American regulations. At present it is almost impossible to obtain delivery of material other than that required for war needs, and even in this respect it is imperative that the purchase be expressly used for essential war requirements. During the past week an effort was made on the part of a delegation of Canadian manufacturers to induce the Government at Ottawa to take some action towards meeting their urgent requirements, and assist in relieving a situation that promises to become extremely serious. While Canadian manufacturers are aware of the priority of war demands, they nevertheless realize that the business of the country will be seriously disorganized unless the embargo on certain steels is partly lifted, thus allowing the entrance of such materials that may be utilized in keeping certain industries going, that would eventually have to close down if the desired steel is not available.

Pig Iron

In order to meet the changes that have been made in the price of steel a corresponding decline has been made in the price fixed for steel-making pig iron. With the exception of Bessemer, the price of which has been set subject to

revision, the quotations on Pittsburgh pig iron represent the figure agreed upon between the Government and the producers. The regulation price of $37.25 a ton for Bessemer shows a decline on the recent open market price of $13.70 per ton, the latest quotation being $50.95. The base price on basic, No. 2 foundry, and malleable has been placed at $33.95, which represents a decline of $9 per ton on basic, $17 on foundry, and $19 on malleable. Quotations at other pig iron centres are at present firm, but it is expected that these will be affected very shortly. No change is noted on the Canadian situation, and the market is still in rather unsettled condition.

Steel

The past week has marked another epoch in the history of the steel industry, one that is still marked by perplexities arising from the action of the American Government in regulating the prices that are to govern the future trade in certain classes of material, at least as far as the remainder of the present year has to deal. It is anticipated that further readjustment will be considered about the beginning of the coming year, but nothing definite can be stated as to the nature of these changes, as they will no doubt be based on the developments of the next three months. Just what effect the recent action will have on business generally is largely problematical, but the fact that many of the largest producers have practically agreed upon the prices that are now in force will tend to steady the market and keep the situation firmly in hand until a fair test has been made under the new ruling. While the announcement regarding the recent regulations has given some relief to the market, there is still in evidence considerable uneasiness as to the action that will be taken in connection with such materials that have not yet received the full consideration of the investigating committees. A feature of present conditions is the result which these developments will eventually have upon Canadian business. At present it is quite possible to secure steel that is specifically required for war necessities, on obtaining a license to that effect, at reasonable dates of delivery, but in face of the prices just put into force there may or may not be increased difficulty in obtaining such material. In the interests of these domestic users of steel and also those manufacturers that are dependent upon the States for plates, shapes, etc., that are now under the ban except for war purposes, a delegation of Canadian manufacturers paid a visit to Ottawa and placed the matter before the authorities in the hopes that some relief might be given and prevent such demoralization of business as would seriously handicap much of the trade that is of vital importance to the nation's welfare. The steel prices that have been agreed upon between the American Government and the large producers are for bars, shapes and plates. The base price on bars has been set at $2.90 per hundred; tank plates, $3.25, and shapes at $3 Pittsburgh, with slight allowance for other points of delivery. These prices have been arranged under agreement, but are subject to revision upon future developments. The local situation is still unsettled, and will likely continue so until some action is taken by the Government regarding the embargo.

Metals

While the primary intention of the American Government, in the regulation of prices on various commodities, was to better regulate the production, sale and distribution of metals, recent developments have not shown that the desired effect will be immediately realized, as the market to-day is, if anything, more unsettled than before. This, however, might have been expected, as it will be some little time before the trade can adjust itself to the changed conditions. The market at present is a very uncertain one, and early conditions will depend upon the way that both the producers and consumers will adapt themselves to the wishes of the higher powers. Copper is experiencing an anxious period, due to the recent fixing of prices. Tin is firm, but influenced by conditions in other metals. Spelter is quiet on poor demand. Lead is dull, with consumers looking for further decline. Antimony and aluminum are both quiet, but unchanged.

MARKET LETTER DEVELOPMENT

The attention of metal working plant executives is directed to the enlargement of the scope and usefulness of our Market Letter Department. In New York and Pittsburgh, expert correspondents have been engaged, and are already furnishing each week concise reports of production activities, price movements, etc., within the territory served by each of these important centres. During the next few weeks, further additions will be made to the number of our United States correspondents, embracing other industrial centres, and enlarging thereby the scope of the meantime service being rendered.

Copper.—As was expected, the regulation of copper prices has not had the effect of removing the uncertainty of conditions. The producers are apparently undecided as to the course they should adopt, and are very reluctant to accept business at the price of 23½c, fixed by the Government. The total absence of details regarding the proposed methods of controlling and distributing copper has maintained the market in a very unsettled condition, and until this matter is more clearly understood it is unlikely that producers will accept business at the price stated. Another feature of the situation is the standing of those consumers that have placed orders at much higher figures; whether the previous prices agreed upon will still hold is a question still unsettled, and further details are anxiously awaited to relieve the nervous tension of the present market. With the situation as it exists to-day, no quotation other than the Government price can be announced. Local conditions are unchanged, and dealers here are anxiously watching developments across the line. Quotations here are firm and unchanged at last week's prices.

Tin.—The situation in tin, while unsettled, is nevertheless fairly well maintained. The market is steady as well as the demand, but prevailing conditions prevent any pronounced activity, as the trade is more or less affected by the uncertainty that prevails in other lines of industry. Prices in New York are steady and unchanged at 61½c per pound. Dealers here report a steady market without feature, the quotation being unchanged at 63c per lb.

Spelter.—This market is very quiet on the absence of any demand, and an undertone of weakness is apparent. Like other metals, spelter is influenced by the Government's policy of regulation, and the situation is, therefore, dependent upon what action will be taken in the near future. A slight decline is reported on New York quotations, but local prices are unchanged at 10½c per lb.

Lead.—The decline that was made in the price of lead a week or so ago seems to have impressed some consumers that further reductions would be announced, as they are endeavoring to get additional concessions before placing future business. While there is an indication that some of the independents might be willing to accept a lower figure than that quoted on the open market, the attitude of the leading producers is a factor in keeping up the price. Recent developments in the lead situation has made the buyers of metal cautious, with the result that they are reluctant to enter into contract for more than their immediate requirements. New York continues to quote on a base of 8c per lb. on a dull market. The market here is unchanged, with the price steady at 11c per lb.

Antimony.—This market is not active, and the general demand is light. While prices are firm, an undertone of weakness seems to be apparent. New York is still quoting 15⅜c, and local prices are unchanged at 18c per lb.

Aluminum.—This market is quiet, but steady, with prices firm and unchanged at 63c to 68c per lb.

Machine Tools and Supplies.

With the exception of a little increased activity in the purchasing of additional equipment for the production of 6-inch shells, the machine tool industry shows no developments of importance. Considerable interest is at present displayed in the disposal of used equipment, as many plants that have been engaged in the manufacture of shells and fuses are endeavoring to sell their machinery. Getting rid of special tools proves a difficult matter, but where the equipment can be adapted to general use the sales are satisfactory, as much of this can be used in those plants that are at present.

or may contemplate, working on various shipbuilding requirements. Supplies on the whole are not in great demand, but slight increase has been apparent where additional orders have been placed for the 6-inch shells.

Scrap

With the general adjustment in the prices of all classes of steel and iron products, as contemplated by the American Government, the market in old materials is awaiting with considerable interest and also anxiety, further action in this connection. The present situation is very unsettled and quotations are mostly nominal. The general tone of the New York market is weaker, but the local market is one of uncertainty, and with the exception of coppers, dealers are quoting last week's prices. A decline of 1c has been announced on light and 2c on heavy, quotations ranging from 19c for the former to 21c for heavy copper and copper wire.

Toronto, Ont., Oct 2. — Activity in the munitions industry is assured for the remainder of the year, at least, as it is understood that further credits have been set apart for this purpose. The manufacture of 6 in., shells will keep those plants going which were formerly producing larger sizes such as 8 in. and 9.2 in. while contracts 4.5 H.E. and 18 pdr. shrapnel will also be distributed among firms already in the business. While circumstances have caused the Imperial Munitions Board to cut down a third of its output the plans for the coming season contemplate an expenditure of about $30,000,000 per month in munition orders. This expenditure taken in conjunction with the activities in other industries will be of the greatest benefit to Canada.

The financial statement of the Dominion for the first half of the fiscal year is regarded as being very satisfactory. Receipts from all sources show an increase of $24,000,000 over the corresponding period of last year. During the six months under review the surplus of revenue over capital and ordinary expenditure amounted to $65,000,000 which was applied in payment of principal of war expenditure in Canada.

Steel

The serious situation developing in Canada in consequence of the United States' embargo on the export, except under licenses, of pig iron, steel plates, chrome nickel steel, boiler tubes, billets, tin plate, and other raw materials of iron and steel manufacture, was discussed last Friday at Ottawa with the Minister of Trade and Commerce, Sir George Foster, by a representative deputation of Canadian iron and steel manufacturers. The Washington embargo prevents the importation into Canada of these basic requirements of the industry unless it is shown they are necessary for munitions work or other win-the-war purposes. The shortage of raw material for domestic use threatens to cause a temporary shutting down of some plants, or at least a restricted output and short shifts. That would materially affect the whole industrial prosperity of Canada. It is possible that steps will be taken under Government supervision to conserve and co-ordinate iron and steel supplies and secure as far as possible a distribution of the limited supplies obtainable, covering a program for the next six months or so. A Controller of steel and iron may be appointed by the Dominion Government for this purpose, with duties analogous to those of the Fuel Controller. A committee of interested manufacturers has been appointed to investigate the situation more fully and to ascertain what firms are needing steel and the extent of their requirements. The data obtained will be placed before the Minister of Trade and Commerce who will then make representations to Washington with the view of a change being made in the existing rulings. It is understood that steel etc., required in the manufacture of agricultural implements, maintenance of railways and shipbuilding will be licensed for export to Canada as being for war purposes or directly contributory thereto.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion $100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the Commission headquarters are at Ottawa.

In spite of the relief that may be obtained through diplomatic channels the steel and iron industry will still be in a complicated condition owing to the shortage in supply of certain steel products due to the heavy demand for material for war purposes in the States. While some material may be permitted to come through it does not necessarily follow that the full requirements will be obtainable. This matter however, will have to be adjusted to meet the situation. In the meantime manufacturers do not know where they stand and business is suffering because of this.

The question of prices continues to cause considerable anxiety in the steel trade. It is not yet clear what immediate effect the new schedule in the States will have on the situation in Canada. In spite of the advance in prices of some steel products last week it now seems practically certain that the crest has at last been reached. That a recession of prices will now set in, however, does not appear likely in the meantime. The general consensus of opinion in the trade seems to be that prices will be more or less stationary for some time and any adjustment downwards will likely be gradual. Warehouses have stocks of steel purchased at high prices and it is not to be expected that jobbers will cut down their prices all at once. Owing to the fact that the mills will be working on old contracts for some time the effect of the new schedules will not be felt just yet, even in the States. Indications rather point to the Canadian market being less influenced by the situation in the States than formerly because of the embargo. Whether the Canadian market will be on its own basis depends, in part, upon the extent of the restriction imposed by the embargo.

The prosperous condition of the steel industry in Canada is revealed in the returns recently issued by the Dominion Department of Mines. The total production of steel ingots and direct castings in Canada in the first six months of the current year amounted to 836,149 short tons, an increase of 246,596 tons, or 42 per cent., over the corresponding period of 1916. The average monthly production was 139,858, against 98,259 in the half of 1916, and 106,268 tons for the full year 1916. A new high record in output was reached in May of 155,346 tons, but the June figures show a falling off of about 18,000 tons.

Pig Iron

Pig iron output in Canada from returns issued by the Department of Mines covering all producers was 586,998 short tons, as against 562,097 in the first six months of 1916. This represents an increase for this year of 24,901 tons which is very satisfactory particularly when considering the shortage of coke, etc., for the greater part of that period. The situation here has not as yet been affected by the new schedule of prices in the States. The embargo may as in the case of iron and steel tend to keep prices up in Canada. In the States pig iron is selling on the new price basis but both consumers and producers are awaiting action by the Pig Iron Committee at Washington to establish differential prices.

Scrap

The scrap market continues unsettled with no business passing to speak of. Both consumers and dealers are awaiting developments and little activity is anticipated until the situation becomes less obscure. The embargo on iron, steel and copper is of course affecting the scrap market. It is tending to stiffen prices of iron and steel but on the other hand non-ferrous scrap is weaker. The price changes this week include spelter, lead and aluminum.

Machine Tools

The general situation in the machine tool market is unchanged. Business continues fairly active and is assuming a more general character although there has been some demand for special tools for making of 6 inch shells. The market in the States is very active and machine tool builders are exceptionally busy on government and other orders connected with the war. Representatives of concerns in the States which have shell contracts are reported to be

in Canada trying to buy up munitions plants.

Supplies

Prices of machine shop and mill supplies continue firm with advances in some lines. Ropes have advanced affecting the following. Pure Manila is now quoted at 39c; British Manila and New Zealand hemp 33c; sisal rope, 27½c; transmission rope 45c and drilling cables 41c per pound, base. The higher prices are due to the increase in cost of raw materials. Turpentine is higher at 69c and putty has also advanced, being now quoted at $4.75 per 100 lbs., in drums. White lead in oil has declined and is now quoted at $18 per 100 lbs., in ton lots.

Metals

There has been no charge in the price of copper here and it does not appear likely that there will be in spite of the new price fixed at Washington. On account of the embargo there is a scarcity of red metal and for this reason prices will be held firm. Lead has declined again in sympathy with the market in New York. The markets generally speaking are dull and unsettled. A good steady business is being done on a hand-to-mouth basis, for under prevailing conditions consumers do not care to buy heavily; the expectations being that lower prices are probable on some metals, but which will decline is difficult to define.

Copper.—The market is holding firm due to the embargo which has caused a scarcity of copper. In New York the market is quiet and business is dull. While the agreed price of 23½c is generally considered fair there is no copper for sale at this price. The leading producers have for some time been withdrawn from the market as they did not want to incur obligations until the U.S. Government had made known its requirements. It is believed that the Government will require a large amount of copper and until this demand is satisfied, the public must wait. The local prices are unchanged, lake and electrolytic being quoted at 32c and castings at 31c per pound .

Tin.—Little interest is being shown in tin and the market is dull. Dealers on this side are watching the London market closely on account of the unsettled situation there. Tin is unchanged at 63c per pound.

Spelter.—The situation has been cleared by the announcement that the U.S. Government has paid 10.67½c per lb., for two million pounds of spelter. The ordinary demand continues quiet and quotations locally are unchanged at 10½c. per pound.

Lead.—Although the price of lead in New York is now down to 8c, business has not been stimulated and the market is dull. Nearby lead is scarce but futures are offered more freely. Lead has declined ½c locally and is now quoted at 11c per pound.

Antimony.—The market has a weaker tendency due to the increase in available supply but quotations are unchanged at 19c per pound.

Aluminum.—The demand for aluminum is lighter and the market continues week and irregular. Present price 62c per pound.

Sydney, Sept. 27.—A fire of unexplained origin destroyed the bankhead of the No. 1. Colliery of the Dominion Coal Company during the night of the 8th September. The colliery was idle until the 24th September, during which short period the headframe and other bankhead arrangements were rebuilt by timber construction, a very creditable performance. The mine is again producing at the same rate as before the fire, and the loss of output has only been between 10,000 and 15,000 tons, much smaller than might have been expected from the completeness of the destruction of the bankhead. The good work of the firemen and the fact that the shaft was an upcast, prevented the extension of the fire to the pit-bottom.

The output of the Glace Bay colleries for September will not exceed 250,000 tons, which compares with 315,000 tons in September, 1916, and 419,000 tons in 1915. Notwithstanding the practical cessation of enlistments the coal production still continues to decline.

There is evident a great desire among the miners and steelworkers to enlist before the conscription draft is made, and although for some time past applications for enlistment from among these essential munition workers have been refused, there will occur a still further restriction of output following the calling of the draft, if for no other reason than the reduction of the available working forces in other industries and in the country at large. The Government has at various times been urged to issue munition workers' badges to the steel and coal workers, so as to give these men some tangible recognition of their importance in national service, but it has unfortunately not been done. No man, or very few among the workers of this district wishes to be a "slacker." A badge is a little thing, but it would have been an effective means of limiting the serious reduction that has taken place in the production of the basic materials, coal and steel.

The following annual figures will give some idea of the reduction that has taken place in the production of coal from the Glace Bay mines of the Dominion Coal Company, and it may be taken as typical of all the other Nova Scotian colleries:

	Long Tons.
1913	4,739,149
1914	4,287,717
1915	4,708,978
1916	4,091,790
1917	3,580,000*
1918	3,300,000*

*Estimated.

The figures forecast for 1918 are the very outside that can be counted upon. The capacity of these mines for output, if sufficient labor were available is 5,250,000 tons, about. It is not difficult to see why there is a shortage of soft coal in Montreal.

Pittsburgh, Sept. 29.—The long suspense as to how iron and steel prices will be made is ended. They will be fixed by agreement between the Government and the producers, and perhaps later on by Government decree resting upon legislation now contemplated. As it was suggested in last report might be the case, an agreement was made upon iron and steel corresponding with that previously made upon copper.

The iron and steel manufacturers assembled in Washington Friday, Sept. 21, as reported a week ago. Addresses were made urging them to settle the matter of prices and to dismiss such opposition as they might have to President Wilson's strongly held view that there should be but one price, applying to the Government, its Allies in the war, and the general trade. It may be mentioned, parenthetically, that there has never been a precise statement as to whether the phrases, "the public" and "the general trade," in this connection would be interpreted as including foreign buyers of steel for commercial purposes. The iron and steel manufacturers accordingly submitted a schedule of prices to the War Industries Board, which conducted the negotiations, and Chairman Scott, of the Board, while observing that the prices were somewhat higher than they had hoped for, agreed to submit them to the President. On Saturday afternoon the manufacturers were advised that the President had accepted the schedule, but it was not until Monday afternoon that the announcement was made by the Committee on Public Information at Washington. The schedule was: Lake Superior iron ore, no change from the 1917 list, which sets Mesabi non-Bessemer at $5.05 on Lake Erie dock; pig iron, $33; steel bars, 2.90c; structural shapes, 3.00c; plates, 3.25c, f.o.b. mill, Pittsburgh or Chicago. Thus Pittsburgh prices as a basis for the whole country disappear, and Chicago is made a separate basing point, a radical departure right at the start.

Merely a Basis

Two things occurred. First, the manufacturers agreed to make "one price for all," whereas legally the Administration had authority to fix prices only with respect to purchases made for the Government's own account. Second, a general basis for prices was adopted. It was not a schedule of prices, but a statement of certain specific prices, from which other prices could be worked out, in proper relation to the basis. What was needed was a basis to determine the general level, and to show what measure of profits the manufacturers should be accorded. The $33 pig iron price applies to basic, No. 2 foundry and malleable, at valley furnaces. Bessemer, low phosphorus, etc., at valley furnaces, as well as prices for various grades at furnace in other districts, are to be worked out. It is suggested that Bessemer should be set at 10 per cent. above basic, as that has been the average spread for years. Birming-

ham prices will probably be a shade below $30. Pig iron prices in general, and prices for the various important finished steel products, are to be worked out by committees of the American Iron and Steel Institute, in the main the committees that have been engaged for several months past in distributing Government orders to the mills in accordance with their tonnage capacity and their ability to produce the various materials. The conclusions of these committees will be placed before the War Industries Board, and prices as approved will be announced at Washington from time to time. The statement is made, apparently upon official authority, that prices upon about 150 iron and steel commodities are to be fixed.

For wire prices it seems quite probable that the official prices of the American Steel & Wire Company will be adopted, these being based upon $3.20 for nails. The prices were first announced March 5 last, and have been adhered to by the leading interest, while independents advanced first to $3.50 and then to $4.

For steel pipe it is likewise probable that the official prices of the National Tube Company will be adopted. This discount list is based upon 55 per cent., and was published April 2 last. Afterwards all the independents but Republic advanced to 49 per cent., and later some advanced to 42 per cent.

To determine a price for billets, a familiar practice often employed in making sliding scale contracts, is to take one and one-half times the price of pig iron, which would make $49.50, and sheet bars for such contracts have usually been set at $1 above billets. Thus billets and sheet bars are likely to be in the neighborhood of $50. If so, black sheets would be fairly fixed at 5.00c, or a trifle less, with blue annealed on a slightly lower basis. Galvanized would be about 1.50c above black.

Market Inactive

Naturally the market has been inactive. There was scarcely any activity before the price fixing agreement, and now there is practically none. The whole thing is new. Producers, of course, do not rush to sell when there has been a radical reduction, even though it is a reduction from a quite fictitious level. Buyers are indisposed to buy, except for early deliveries, and these the mills cannot make. The new prices are subject to revision January 1 or later. There is also the contingency that the Pomerene Bill, now in the Senate, may be enacted. It looks to giving the Administration full legal authority to fix all iron and steel prices for everybody. With such authority the Administration might be disposed to reduce prices below the present agreed level. In the circumstances, there will be little disposition in future for producers to sell, or consumers to buy, for deliveries far ahead. The Priority Board is to have strict supervision of the sequence in which orders are filled, and thus the placing of an order by a commercial buyer does not insure that it will be filled at any particular time. In the circumstances, with the mills well filled with orders and with the great mass of consumers correspondingly well covered, there will be a transition to a condition of hand-to-mouth buying, relatively speaking. This necessarily involves a period, perhaps of several months, in which commercial buying will be quite light.

Enormous War Orders

An immediate result of the price agreement is that large war orders will be placed. Upon excellent authority it is stated that within two months the Government will distribute orders for about 7,000,000 tons of steel, chiefly for shipment in 1918. While the Government has been placing orders right along, chiefly at tentative prices, to be revised when the price question should be finally settled, it has naturally held back such business as could be held back without detriment to the prosecution of the war. Substantially all the purchases on account of our Allies have been held back since the Government did not have, as in the case of its own purchases, the power to fix the prices. Thus a large amount of business has accumulated, and the 7,000,000 ton statement, while somewhat startling, really furnishes no cause for astonishment. Production of finished rolled steel has of late been at the rate of about 33,000,000 tons a year, while the capacity is equal to 35,000,000 tons or more, full operation having been impossible, chiefly because of shortage of coke. Thus the 7,000,000 tons is in the neighborhood of 20 per cent. of a year's output. Part of it is merely in sequence to the steel furnished the Entente Allies last year, when production was less, only about 30,500,000 tons. Eventually there should be plenty of steel for commercial requirements.

Coke

While a price for Connellsville coke was fixed at the same time that steel prices were agreed upon, the procedure was slightly different, and the principle was different. The procedure was different in that the President accepted without modification the iron and steel prices submitted, while the $6.50 price submitted by the Connellsville coke producers he cut by 50c, making the announced price $6. The principle was different in that the President, under the Lever Act, has full authority to fix the coke price for everybody. A differential for foundry coke, above the $6 furnace coke price, will doubtless be established.

New York, Oct. 1st.—Great excitement prevailed throughout the iron industry last Monday when Washington authorities announced the prices—established through co-operation between the Government and large producers—to rule for thre months upon current and future orders for steel bars, shapes and plates and for raw material—iron ore, coke, and pig iron—placed by the United States and Allied Governments and by the American public with the producing interests. The statement made by the Government was so meager, ambiguous and perplexing that manufacturing consumers were thrown into the utmost confusion and business was entirely suspended for several days. Later, some of the many pertinent questions asked about prices were re-assuringly answered by representatives of the producers who had attended the Washington meetings, but, still other obscure points, upon which enlightenment is desired, cannot be passed upon until after the conferences of the War Industries Board with the Committees of the Iron and Steel Institute, having jurisdiction over the affairs of pig iron and steel, that are scheduled for this and next week. At these meetings prices will be established upon steel ingots, billets, sheet bars, wire products, tubes, sheets, tinplate and a host of minor products. Differentials will also be fixed on the various kinds and grades of pig iron and steel products.

The prices thus far established are base prices and it is now known that $5.05 per ton for iron ore at lower lake ports applies to Mesaba non-Bessemer, there being no change from the price previously current in the open market on season contracts. The price of $6.00 per ton for coke at Connellsville ovens, presumably applies to foundry as well as to furnace fuel, but it is possible that a differential may be established. The base price for pig iron, $33 per ton, is for basic and for No. 2 foundry at Northern furnaces. The prices of 2.90c for bars, 3.00c for shapes and 3.25c for plates, Pittsburg and Chicago base, are equivalent to $58 per net ton for bars, $60 per ton for shapes and $65 per ton for plates. Differentials are yet to be established for special grades. It is believed that the price of steel ingots will be fixed at approximately $40 per ton and for billets at close to $47.50 per ton, based upon conversion charges of $7 and of $7.50 per ton respectively, from pig iron to ingots and from ingots to billets.

The War Industries Board has determined that all contracts made prior to last Monday shall remain inviolate and that shipments shall be made against these contracts, subject only to priority of war orders, as speedily as is possible. These contracts must be worked out before consumers can purchase additional supplies on the new basis of prices. Some impetuous consumers, imagining that they can now buy steel at the fixed Government prices for early shipment, have come to grief. Almost no steel will be available for purely commercial purposes until the war requirements of the United States and Allied Governments have been satisfied, and as these contracts, now aggregating 7,000,000 tons, having priority of shipment—and will soon be increased by several more million tons—there is small prospect that the public can obtain new material, direct from the mills, inside of three to six months. It is understood that in the near future all applications to purchase steel products of any kind will be referred to Washington where preference will be given to consumers working upon war munitions contracts whether obtained directly or indirectly from the Government.

The Steel Committee of the Iron and Steel Institute, that recently suspended its activities in distributing orders among the mills on behalf of the Government until its legal status was established, will resume this function within a week, now that the Government and the steel industry are working in co-operation. Specifications against heavy war contracts are now being made expeditiously—several hundred thousand tons in the last week—and within sixty days, disposition of the entire 7,000,000 tons will have been made. Great Britain, France and Italy are still negotiating for nearly 1,000,000 tons more steel, including 500,000 tons of shell bars and forgings for England. France and Italy are most anxious for steel to be used in ship building, including war craft. The shipbuilding program of the United States and Allies calls for 2,400,000 tons of steel. Back of these great tonnages are heavy requirements for railroad equipment to be put into service in France and Russia.

RESTRICT COAL INTO CANADA

ALL shipments of coal into Canada from American lake ports were ordered stopped last Sunday by Fuel Administrator Garfield, to divert coal from these ports to meet fuel shortage in the Northwest. The order also directs that producers shall fulfill contracts for delivery of coal to Lake Erie ports for transhipment, directs all handling agencies to expedite shipments, and forbids the reconsignment of such coal to any points either in the United States or Canada other than the Northwest.

When the diversion of coal to Canada first was protested against Dr. Garfield announced that the Exports Council would be asked to license no shipments to Canada without consultation with the Fuel Administration. The Canadian buyers continued to drain the lake ports of their coal however, and of 180,000 tons shipped daily on lake carriers, only about 53,000 tons have been reaching the Northwest. To meet the needs of the section the daily shipments should average 150,000 tons.

EXPLOSIONS of coal dust can be prevented, according to Dr. J. Harger, of the Society of Chemical Industry, Liverpool University. His experiments proved that a small reduction of oxygen and the addition of a little carbon dioxide was sufficient to render coal dust ignition impossible. The reduction in oxygen necessarily varied with the different coals and with the method of working. In most mines a reduction of 1 per cent. in the oxygen and the addition of ½ per cent. of carbon dioxide was sufficient. With others a reduction of nearly 2 per cent in the oxygen and an addition of ¾ per cent. carbon dioxide was necessary to render them safe. If the reduction in oxygen was made to 17½ per cent., with ½ per cent. to 1 per cent. carbon dioxide, absolute safety was secured, not only from coal dust, but from fire-damp explosions.

Enlarged Canadian Trade Intelligence Service

Under the arrangement made by the Minister of Trade and Commerce with Sir Edward Grey in July, 1912, the Department of Trade and Commerce, Ottawa, is able to present the following list of the more important British Consulates whose officers have been instructed by the Foreign Office to answer inquiries from and give information to Canadians who wish to consult them in reference to trade matters.

BRAZIL—Bahia, British Consul. Rio de Janeiro, British Consul General.

CHILE — Valparaiso, British Consul General.

COLOMBIA — Bagota, British Consul General.

ECUADOR—Quito, British Consul General. Guayquil, British Consul.

EGYPT — Alexandria, British Consul General.

FRANCE—Havre, British Consul General. Marseilles, British Consul General.

INDIA—Calcutta, Director General of Commercial Intelligence.

ITALY—Genoa, British Consul General. Milan, British Consul.

MEXICO—Mexico, British Consul General.

NETHERLANDS—Amsterdam, British Consul.

PANAMA—Colon, British Consul. Panama, British Vice-Consul.

PERU—Lima, British Vice-Consul.

PORTUGAL—Lisbon, British Consul.

RUSSIA—Moscow, British Consul General. Petrograd, British Consul, Vladivostock, British Consul. Odessa, British Consul General.

SPAIN—Barcelona, British Consul General. Madrid, British Consul.

SWEDEN—Stockholm, British Consul.

SWITZERLAND—Geneva, British Consul.

URUGUAY—Monte Video, British Vice-Consul.

VENEZUELA — Caracas, British Vice-Consul.

Canadian Commercial Intelligence Service

The Department of Trade and Commerce invites correspondence from Canadian exporters or importers upon all trade matters. Canadian Trade Commissioners and Commercial Agents should be kept supplied with catalogues, price lists, discount rates, etc., and the names and addresses of trade representatives by Canadian exporters. Catalogues should state whether prices are at factory point, f.o.b. at port of shipment, or, which is preferable, c.i.f. at foreign port.

CANADIAN TRADE COMMISSIONERS.

ARGENTINE REPUBLIC—B. S. Webb, Acting Canadian Trade Commissioner, Reconquista, No. 46, Buenos Aires. Cable address, Canadian.

AUSTRALIA—D. H. Ross, Stock Exchange Building, Melbourne. Cable address. Canadian.

BRITISH WEST INDIES—E. H. S. Flood, Bridgetown, Barbadoes, agent also for the Bermudas and British Guiana. Cable address, Canadian.

CHINA—J. W. Ross. 13 Nanking Road, Shanghai. Cable address, Cancoma.

CUBA—Acting Canadian Trade Commissioner, Lonja del Commerci, Apartado 1290, Havana. Cable address, Cantracom.

FRANCE—Phillipe Roy, Commissioner General, 17 and 19 Boulevard des Capucines, Paris. Cable address, Stadacona.

ITALY—W. Mc. Clarke, c/o H. M. Consul, Milan.

JAPAN—E. F. Crowe, Acting Canadian Trade Commissioner, P. O. Box 109, Yokohama. Cable address, Canadian.

HOLLAND—Ph. Geleerd, Acting Canadian Trade Commissioner, Zuidblaak, 26, Rotterdam. Cable address, Watermill.

RUSSIA—C. F. Just, Canadian Government Commercial Agent, Alexandrinskaia, Plosch 9, Petrograd. L. D. Wilgress, Canadian Government Commercial Agent, Bukhgolza Ulitza No. 4, Omsk, Siberia.

NEWFOUNDLAND—W. W. Nicholson, Bank of Montreal Building, Water Street, St. John's. Cable address, Canadian.

NEW ZEALAND—W. A. Beddoe, Union Buildings, Customs Street, Auckland. Cable address, Canadian.

SOUTH AFRICA—W. J. Egan, Norwich Union Buildings, Cape Town. Cable address, Cantracom.

UNITED KINGDOM—Harrison Watson, Sub-division E.C., 2, 73 Basinghall Street, London, E.C., England. Cable address, Sleighing, London. N. D. Johnston, Sun Building, Clare Street, Bristol. Cable address, Canadian. J. E. Ray, Central House, Birmingham. Cable address, Canadian. J. Forsyth Smith, 31 North John Street, Liverpool. Cable address, Cantracom. F. A. C. Bickerdike, 4 St. Ann's Square, Manchester. Cable address, Cantracom. J. Forsyth Smith, Acting Canadian Trade Commissioner, 87 Union Street, Glasgow, Scotland. Cable address, Contracom.

CANADIAN COMMERCIAL AGENTS

AUSTRALIA—B. Millin, Royal Exchange Building, Sydney, N.S.W.

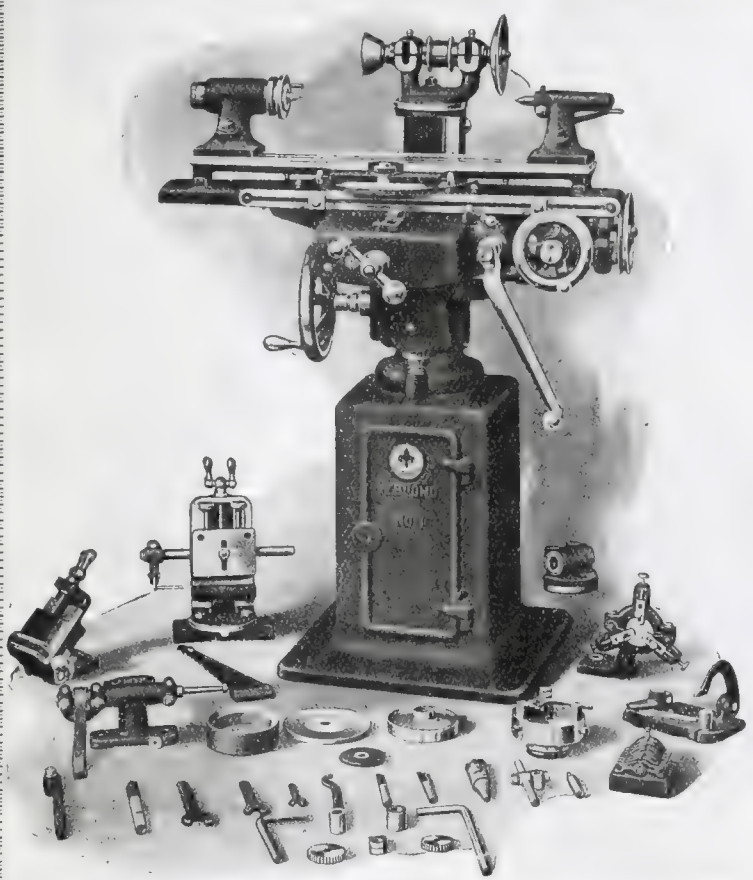
BRITISH WEST INDIES—Edgar Tripp, Port of Spain, Trinidad. Cable address, Canadian. R. H. Curry, Nassau, Bahamas.

NORWAY AND DENMARK—C. E. Sontum Grubbegd No. 4, Christiania, Norway. Cable address, Sontums.

SPAIN—J. F. Roberts, Hotel Cuatro Naciones, Barcelona.

CANADIAN HIGH COMMISSIONER'S OFFICE

UNITED KINGDOM—W. L. Griffith, Secretary, 17 Victoria Street, London, S.W., England. Cable address, Dominion, London.



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INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News

ENGINEERING

Lachine, Que.—The Dominion Wire Rope Co. will build an addition to their factory here.

Toronto, Ont.—The Dominion Wheel & Foundries, Ltd., contemplate building a machine shop to cost $5,000.

Hamilton, Ont.—The Acme Tool & Stamping Co. have awarded a contract to the Hamilton Bridge Works, for the steel for their new factory addition.

Toronto, Ont.—A building permit has been granted to Canadian Aeroplanes, Ltd., to erect a $1,500 addition to their dry kiln on the West side of Dufferin street.

Sydney, N.S.—Coal is again being hoisted from No. 1 colliery. This is the same one in which a fire broke out three weeks ago, but energetic measures were taken to restore the mine to working conditions.

Port Arthur, Ont.— A company which has ben formed here has secured an option on 200 acres in Conme Township to exploit deposits of molybdenite. It is understood that the ore will grade about 20 lbs. to the ton.

Montreal, Que.—It is reported here that several Canadian concerns which have been engaged in the manufacture of munitions have received offers for the purchase of their plants by manufacturers in the United States, but only the preliminary stages of the negotiations have been reached as yet.

Montreal, Que.—Following a meeting of the Board of Directors of the Shawinigan Water & Power Co. on Sept. 26, President J. E. Aldred stated that before the end of the year 18,000 h.p. of new business would go into effect on the system, 15,000 of this at Shawinigan Falls alone. That increase would be in addition to 6,000 h.p. connected up as a new load so far this year.

Montreal, Que.—The Canada Foundry and Forgings Co. is going into the shipbuilding industry extensively and contemplates purchasing the plant of the Delaney Iron and Forge Co. at Buffalo. The Canadian concern will operate in Buffalo as well as in Welland. A special meeting of the shareholders of the Company will be held at Brockville on Oct. 10, to ratify the Delaney deal.

Kirkland Lake, Ont.—Work of pouring concrete for the foundations of a new 80-ton mill commenced last week. Due to the fact that most of the building material for the mill building is on the ground, construction work should be pretty well completed within the next five weeks. After that the installation of machinery can be gone on with, and before the close of the current year, this mill should be making its initial run.

Temiskaming, Ont.—The Riordon Pulp and Paper Co. has acquired a site near Temiskaming, on the Upper Ottawa, for the building of a large sulphite mill and paper plant, and the opportunity is being taken to develop a model town adjacent to the mill site for the housing of the employees of the company and others. The plan of the town has been prepared by Thomas Adams, of Ottawa, of the Commission of Conservation, as consulting engineer.

ELECTRICAL

Bradford, Ont.—The ratepayers will vote on the Hydro-Electric by-law on Oct. 6.

Fort William, Ont.—The ratepayers voted in favor of the Hydro-Electric by-law by a majority of 7 to 1.

GENERAL

Fergus, Ont.—Monkland's Mills, owned by Jas. Wilson & Sons, were destroyed by fire on Sept. 29.

Elgin, Man.—Fire on Sept. 23 completely destroyed the Western Canada Elevator and the Imperial Oil Co.'s plant here. The total loss is estimated at $15,000, which is covered by insurance.

London, Ont.—The Battle Creek Toasted Corn Flakes Co. will build an extension to their factory at a cost of $50,000. This amount will include buildings, storage tanks and machinery. The additional buildings will be of brick and concrete, a three-storey building of 50 x 60 feet, and a one-storey building of larger dimensions. Six large fireproof storage tanks will be erected. The contract for the buildings and grain tanks has been let the Archibald & Holmes Co., of Winnipeg.

MUNICIPAL

Chapleau Township, Ont.—A by-law will be submitted to the ratepayers on Oct. 9, to authorize an expenditure of $6 000 for addition to pumping station and installation of an electrically-operated pumping unit.

Toronto, Ont.—By a vote of 12 to 7, the City Council at a special meeting on Friday decided to sell the municipal abattoir to the Wm. Harris Co., Ltd., for the sum of $427,784, on condition that the purchasers entered into an agreement with the city to provide accommodation for the smaller butchers to continue the slaughtering of their animals under similar terms and conditions now existing.

Niagara Falls, Ont.—The Hydro-Electric Power Commission has denied this city permission to build a submerged dam in the Upper Niagara River for the purpose of supplementing the city's water supply. Sir Adam Beck told the Water Commission that some permanent arrangement will be made with the city for a full water supply. In the meantime the city will be allowed to supplement its supply from the Ontario Power Co.'s conduit.

BUILDINGS

Toronto, Ont. — Fairweather & Co. have acquired the lease of 90 Yonge street for twenty-one years, renewable. A fireproof steel and concrete building will be erected on the ground.

Regina, Sask.—The T. Eaton Co. has purchased Dominion Park, Regina's athletic grounds, for $100,000, and will erect a distributing warehouse on the property. The deal has been ratified by the city council.

Montreal, Que.—A permit has been issued to the Canadian Northern Express Co., to build an office building on Mansfield street at a cost of $58,000. The building will be on the east side of Mansfield street, near Dorchester and will be 100 x 79 feet.

Windsor, Ont.—Contracts for the construction of some one hundred and fifty brick residences at Ojibway, near here, will, it is expected, be awarded to Canadian contractors by the Canadian Steel Corporation probably this week. This work will cost approximately one million dollars, and is apart from the building of a dock and a canal on the river front below Sandwich, all of which is to be a part of the new steel city. Already railroad tracks and pavements cover the new territory, and preliminary work for the construction of the docks has been under way for the past two months.

CONTRACTS

Granby, Que.—The Southern Canada Power Co. have let the general contract for a sub-station here to Loomis, Dakin & Co.

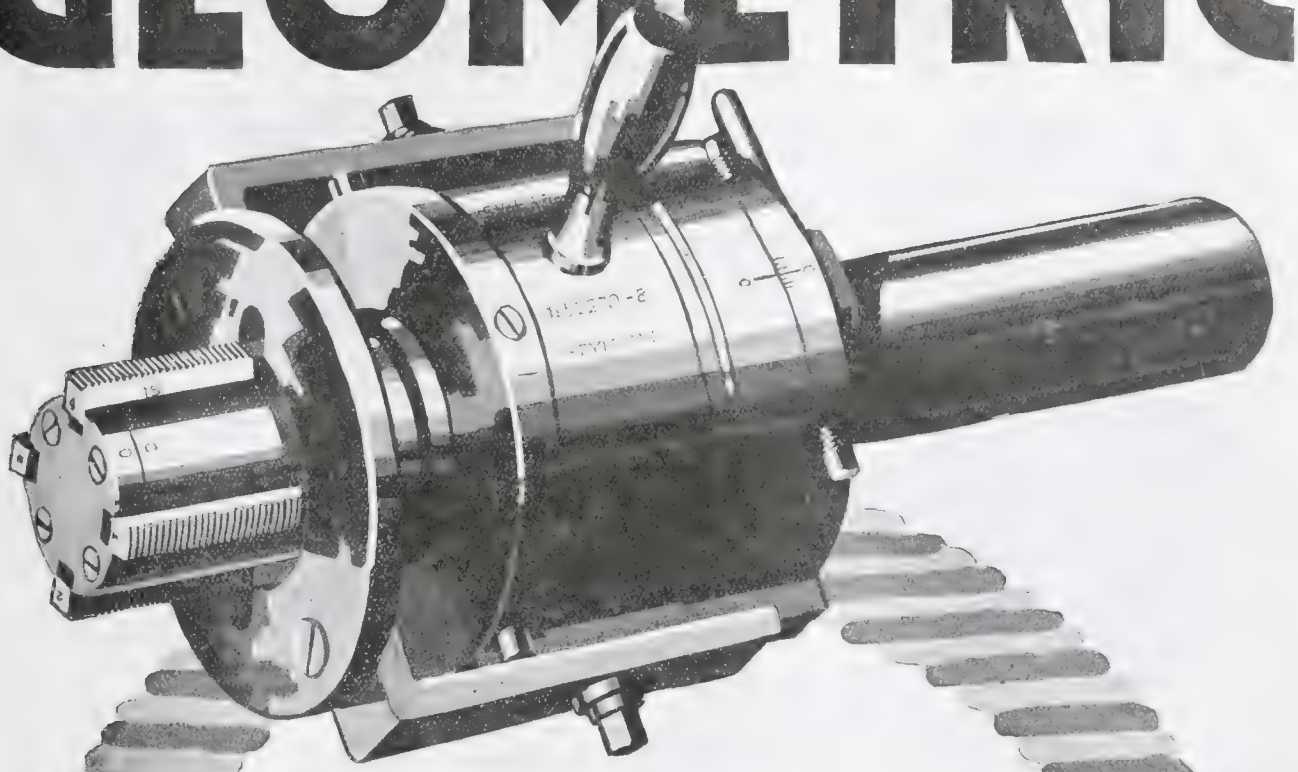
Chambly Canton, Que.—The Otis-Fensom Elevator Co., Montreal, have been awarded the elevator contract for the new factory for the Canadian Leatherboard Co.

RAILWAYS—BRIDGES

Belleville, Ont.—The overhead wooden bridge which spanned the G. T. R. tracks on North Front Street has been torn down, preparatory to the erection of an up-to-date steel structure, the building of which will be proceeded with as rapidly as possible.

Montreal, Que.—The Montreal and Southern Counties Railway has ordered for its South Shore service six new passenger cars—three with motors and three of the trailer type. They are being built by the Ottawa Car & Manufac-

GEOMETRIC



The Tap Famous For Good Work

Geometric Collapsing Taps share the popularity of Geometric Die Heads. They have the same good reputation for tapping inside threads that the Die Heads have for cutting outside threads. All objections of a solid tap are overcome in the Geometric Collapsing Tap. They are as rigid as solid taps while cutting, but collapse the chasers automatically when the required depth of thread has been cut. Are adaptable to Screw Machine, Turret Lathe or Live Spindle. Made in sizes suited to any diameter above ¾-inch in straight threads or standard pipe thread sizes.

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turing Co., and will be in service by November 1st. The new cars are 55 feet long by 8 feet, 1½ inches in width; have steel underframes and interiors, finished in mahogany. They are divided into two sections—the general passenger compartment and smoking compartment, and have forced ventilation and hot air heaters.

PERSONAL

Robert Sloane Gourley, president of the Toronto Harbor Commission has had his term of office extended another three years by the Dominion Government.

Michael P. Fennell has been appointed secretary-treasurer of the Montreal Harbor Commissions, to succeed Major David Seath, who has retired after holding that position for eighteen and a half years. Mr. Fennell has been assistant secretary-treasurer of the Commission since 1909.

Matthew W. Kirkwood, former general superintendent of the G., P. and H. and L. E. and N. Railway, Galt, Ont., has been promoted to general manager of the two roads. Mr. Kirkwood has been identified with the first named radial for 23 years, commencing as electrician and master mechanic.

Milne Martin Todd, of Galt, Ont., third son of the late Martin N. Todd, has been elected to succeed his father as president of the G., P. and H. Railway and vice-president of the L. E. and N. Railway. Milne M. Todd represents the third generation of the Todd family to hold the presidency of the G., P. and H. Railway. Mr. Todd is 24 years of age.

Francis H. Sheppard, M.P. for Nanaimo, has been selected by the Dominion Government, it is understood, for the position of inspector of dredging for British Columbia. Mr. Sheppard is an engineer by profession. He has had considerable experience in mining engineering in Canada, Australia, New Zealand and Alaska, and in railroad construction in British Columbia.

Lawrence H. Cooney, general manager of the St. Algoma Steel Co. plant and wharves at Sault Ste. Marie, Ont., has resigned. He was for many years in charge of the rolling mill department of the Ohio Works, Carnegie Steel Co., Youngstown, Ohio, before coming to Canada three years ago. He is to be succeeded at the Algoma works by **James Nelson,** who for the past year has been in charge of the duplex department of the Bethlehem Steel Co. at Bethlehem, Pa.

The Electric Furnace Construction Co., Philadelphia announces that **Frank W. Brooke,** who was originally connected with the Gronwall Dixon furnace at Detroit, and latterly as metallurgist for the Ludlam Steel Works and the Ludlam Electric Furnace Co., is joining their staff as director. Mr. Brooke will be responsible for the construction and running of the Greaves-Etchells Furnaces. He will be assisted in the erection and installation by **G. W. Ketter, B.Sc.,** who has installed a great many of the electric furnaces now running and who has just completed the installation of ten furnaces for the British Forgings Co., Toronto.

TRADE GOSSIP

The Electric Furnace Construction Co., 1304 Finance Bldg., Philadelphia, makes the following announcement of contracts closed for the "Greaves-Etchells" elec? tric furnaces: Steel Corporation of South Africa, two 5-ton furnaces; Sociedad Espanola De Construction Naval Madrid, two 10 and one 6-ton furnaces; Singer Manufacturing Co., New York, one 6-ton furnace.

Regina, Sask.—The local Scientific Research Association is asking the Cabinet to bring influence to bear on the Federal Government to take practical action to encourage research work. The proposals include the provision that $2,500,000 be granted annually for five years, to be divided between the various provinces for industrial research work.

The St. Lawrence Welding Co., of Montreal, have opened up their new brass foundry at 39 Olier Street. The plant is equipped on a large scale with all the latest brass foundry requirements and production of castings has recently been started. The firm has secured the services of Robert Stark, who is one of the best known foundry men in Canada, and who will have charge of the brass foundry under the direction of A. M. Barry.

Fredericton, N.B.—It is reported that anthracite coal has been discovered in the Salmon River district of Queen's County, about 50 miles from here, by Capt. Russell Bellaney, a geologist of New York City. Tests made showed it to produce an intense heat and to be almost odorless and clinkerless. It ignites quickly and burns slowly. It is estimated conservatively that there is at least a half-million tons in sight.

Interesting Electric Furnace Performance.—A "Greaves-Etchells" furnace of two tons capacity was recently started up at Messrs. Kayser, Ellison & Co., Sheffield, England, on special aeroplane steels, and 28 heats of sound steel were obtained from cold new furnace started Monday noon to Friday evening. The firm reported the furnace could have been worked quicker, but the men were not accustomed to such rapid melting with a new furnace.

The Homestead Valve Mfg. Co., of Homestead, Pa., announces that it has almost completed the rebuilding of its manufacturing plant and office buildings, whereby it added about 75 per cent. additional space to take care of the increase in its business. In addition to adding more floor space in its factory and offices the company has also added considerable new machinery and equipment, especially in the foundry, where the production has been almost doubled in a short time.

Canada's Trade Balance.—For the eight months of the calendar year Canada is credited with a favorable trade balance of $227,266,000, or about $37,000,000 ahead of the record established in the corresponding period a year ago. If comparison is made with the previous cycle of business activity in this country, say around the 1912-13 period, when the eight months' figures were showing unfavorable balances of upwards of $200,000,000, the net improvement in the trade position so far this year amounts to about $450,000,000.

Big Shipping Plan in the U. S.—The Shipping Board plans call for 1,200 merchant vessels of about 6,000 tons being completed within a little more than a year. Completion of ships commandeered in shipyards and of vessels actually or about to be contracted for will give the United States a fleet of 1,600 ships with a total tonnage of more than 9,000,000. In addition to this, the board will complete in 1919 vessels already contracted for, and under negotiation of about 4,000,000 tons. A billion dollars has just been asked of Congress to complete the programme.

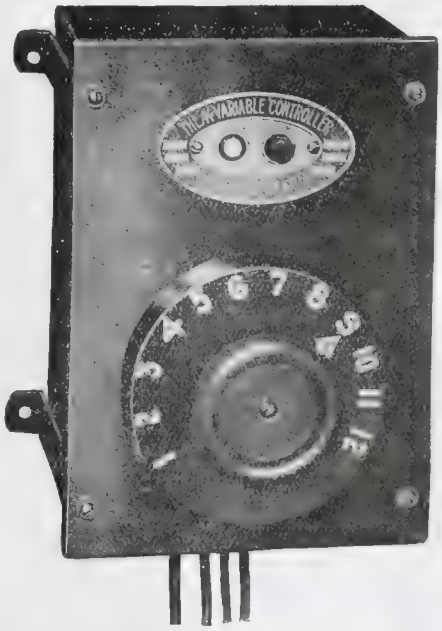
Hamilton, Ont.—The following tenders have been submitted in connection with the proposed pumping installation for the Beach Station:—Allan General Supplies Co., $3,715; Canadian General Electric Co., transformers, $14,010; DeLaval Co., centrifugal pumps, $22,420; Canadian General Electric Co.. switching apparatus, $4,990; Canadian Westinghouse Co., motors, $16,620; Babcock & Wilcox Co., boilers and insulation, $17,555; Turbine Equipment Co., steam turbine pumps, $52,517. The original estimate for the pumping equipment was $127,000.

Building Concrete Ships at Montreal.—The concrete boat now being built by the Atlas Construction Co. for a number of Montreal capitalists, is fast approaching the stage when the pouring of the cement will commence. The reinforced steel frame is about finished, and the exterior form is just about completed. About the 1st of October it is expected that the placing of the inner forms will be started and a week later the concrete will be poured. When this latter operation begins, the pouring of the mixture will be continuous until well above the load water line, to insure a homogeneous body of material.

Coal Situation Better Than Year Ago. Cities and larger towns in Canada are better supplied with anthracite coal at present than they were at the same period of last year, according to reports received by the Dominion Cost of Living Commissioner. In smaller centres throughout Canada, however, there is a grave shortage of hard coal. This statement of the fuel situation is based upon the reports of 2,500 coal dealers in various parts of the Dominion. The Cost of Living Commissioner's office is now simply investigating organization which discloses conditions, and should action be required reports to the Fuel or Food Controller.

New Japanese Industry.—When the present war broke out and checked the supply of potassium chloride to the United States, Japan prohibited the sale of the chemical to foreigners, at the

Aikenhead's A. K.

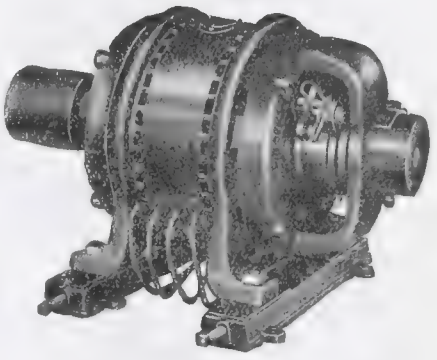


The A.K. Motors are built for high efficiency and long durability.

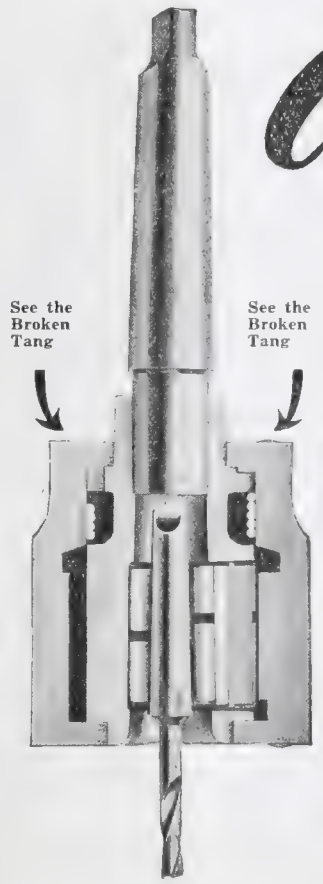
Single Phase, Variable Speed Type will run on 110 or 220 volts, 25 or 60 cycle.

These come in sizes from ¼ to 1¼ H.P. complete with 12-speed controller and 1½ to 6 H.P. with 49-speed controller.

MOTOR AND CONTROLLER



Aikenhead Hardware Limited, 17, 19, 21 Temperance St., Toronto, Can.



Aikenhead's New Chuck

Don't Throw Away Broken Tang Drills

Perhaps you are about to discard some taper shank drills because the tangs are broken off—DON'T DO IT—they are worth their weight in gold. You can use them just as they are with a

Wahlstrom Automatic Chuck

One chuck holds drills from 1/16" to 1¼"

and you won't have to take time from your production to repair them.

Tool changes are made in two seconds—just grasp the shell of the chuck with one hand and put in or remove the tool with the other—no collets—no lost time, for the spindle never stops. The jaws grip, NOT BY THE TANG, BUT ON THE SIDE OF THE TAPER—there's no chance for slippage— Wahlstrom won't even mar the shanks.

AIKENHEAD HARDWARE LIMITED

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If any advertisement interests you, tear it out now and place with letters to be answered.

same time encouraging its production. At that time there was only one factory in Japan, its production being 600 barrels a month. Since that time, Japan has so increased her capacity for producing this chemical that she is selling large quantities to American match companies. The material originally sold at $20 per barrel, which is a normal price. A Kobe firm recently made a contract for 2,500 barrels, and later another contract for 6,000 barrels. The last quotation was $42.50 per barrel, an increase of almost 50 per cent. in the past seven months.

Emery Mines Closed.—One of the effects of the war has been to close the great emery mines of Asia Minor to the Entente Allies, and as emery is an absolute necessity in the manufacture of ammunition, Greece has become one of the chief sources of supply in fine emery, produced on the Island of Naxos. The American ammunition makers took most of it in 1915 when they were rushing their orders to the Allies, American firms taking 9,000 tons of this Greek emery. But the product was considered so essential to the war that the French Government took over the mines last year, and are operating them so that all the Allies obtain a share of this essential of shell-making. Last year the share going to the French ammunition makers reached 17,599 tons, while the amount sent to the United States fell to 1,600 tons.

Dominion Finances Satisfied. — The financial statement of the Dominion for the first half of the fiscal year, which ended on September 30th, is regarded by the Minister of Finance as most satisfactory. Receipts from all sources show an increase of $24,000,000 over the corresponding period of last year. Payments on capital and ordinary account, including the increased interest and pension charges, are $1,800,000 less than for the first six months of last year. The net result, apart from war expenditures, shows an improvement in the financial position of $25,000,000, as against the first half of the year 1916-17. During the six months in question, the surplus of revenue over capital and ordinary expenditure amounted to $65,000,000, which was applied in payment of the principal of war expenditure in Canada.

Charter Rate Fixed for Ocean Tonnage.—A Washington, D.C., despatch states that a charter rate of $5.75 a ton a month has been decided on by the Shipping Board as a base the U. S. Government will pay for requisitioned ocean-going merchant vessels. Within a short time the board will take over for Government use every American vessel available for overseas service. This amount compares with a present tonnage of 3,500,000, of which 700,000 tons represent German and Austrian ships under operation by the United States. The American ships available for overseas service number 548, with a tonnage of 2,871,000. There are 117 German and Austrian ships with a tonnage of 700,000. The Emergency Fleet Corporation has commandeered in American shipyards nearly 400 steel ships of more than 2,500,000 tons, and has contracted for 636 ships with a tonnage of 3,124,700.

Lake Boats for Atlantic.—In order to meet the great demand for steamers to handle the traffic between Canada, the United States and British and European ports, the Department of Marine and Fisheries, Ottawa, is collaborating with the United States Shipping Board in transferring boats formerly plying on the Great Lakes to the overseas routes. A representative of the U. S. Shipping Board was in conference with officials of the department recently, when arrangements were made for the transfer of a number of U. S. steamers now on the Great Lakes to the Atlantic service. These vessels, when too large to pass through the canals, will be cut in two. Some will be docked at the Canadian Vickers plant at Montreal, and others at the Marine Department shipyard at Sorel, where they will be put together again for the trip around to an Atlantic port. The Marine Department has for a considerable time been making arrangements whereby a number of boats on the Great Lakes will be put on the Atlantic routes before the close of lake navigation.

MARINE

Montreal, Que. — It is reported here that the United States Government will take over a big ship repair equipment plant at Buffalo and remove it to Montreal to rejoin lake vessels which are brought in sections through the Welland Canal.

Crew of Meaford Get $500.—Geo. E. Fair, managing director of the Farrar Transportation Co., Toronto, has received a cheque for $500 from the Department of Naval Service, Ottawa, for distribution among the crew of the SS Meaford for sinking a German submarine in the Mediterranean on June 12th of this year.

Victoria, B.C.—For the housing and assembling of marine engine parts, a contract has been let to Grant, Smith & Co. and McDonnell, Ltd., for the construction on Pier 2 of the new ocean docks, at Ogden Point, of a shed which will use up 2,000,000 feet of lumber in building. The structure will be 703 feet in length by 200 feet in width. Henry A. Bayfield, former superintendent of Dominion dredges, has been appointed by the local representatives of the Imperial Munitions Board to take full charge of the plant.

Halifax, N.S.—Foley Bros., Welch, Stewart & Fauquier, contractors for the Halifax Ocean Terminals, have commenced the undertaking of refloating the wrecked Canadian hospital ship Letitia. The big Donaldson liner lies with her bow well upon a ledge of rock ten miles from the centre of Halifax harbor. Nearly half of her length overhangs in deep water, and from the time of her wreck it has been feared that the hull would not stand the immense strain and that her complete submersion was a matter of a short time. The powerfully-built hull is, however, still practically intact.

To Assist Shipbuilding.—The visit of Lord Reading and Lord Northcliffe to Ottawa this week will bring to the front the financial situation. Ways and means will be discussed of utilizing to the full Canadian resources, and possibilities here with respect to an accelerated shipbuilding programme will be reviewed. Recognizing that shipbuilding is a war purpose, the United States is permitting the exportation of steel plates to this end. The committee appointed to investigate steel conditions in Canada, in view of the establishment of a licensing system in the United States, is expected to report shortly.

TENDERS

Montreal, Que.—Tenders for purchase of tug "Montmorency" will be received at this office until Friday, October 12, 1917. This tug is constructed of wood, has a length over all of 68 feet, a beam of 11 ft. 5 in., and draft of 6 ft. It is equipped with a triple expansion engine and a Robert type pipe boiler. Further particulars and information as to the locality where it can be examined can be had from J. L. Dansereau, district engineer, Shaughnessy Building, Montreal, P.Q.

CATALOGUES

The Vanadium Alloys Steel Co., Pittsburgh, Pa., has mailed to the trade the latest stock list of "Red Cut Superior" high-speed steel in warehouses at Pittsburgh, Pa., and Latrolie, Pa.

Cheap Steam.—The May issue of the organ "Cheap Steam" has been mailed by Ed. Bennis & Co., Little Hulton, Bolton, England. This publication contains a short descriptive article covering power plants where Bennis stokers are installed and other matter of interest to steam users.

Knudsen Packless Joints.—Bulletin issued by the Universal Valve Co., Burlington, Vt., describing the Knudsen packless swivel joint for iron pipe in steam, gas air or ammonia lines. The advantages claimed for this joint and details of its construction are dealt with fully, while a number of views are included showing applications under various conditions.

Pulleystone for Belts.—Bulletin distributed by the National Chemical Works, South Acton, London, England, deals with the material "Pulleystone" for coating main driving pulleys and for other purposes where belt dressing is used. The main advantages claimed for this material are given in detail. Reference is also made to a material named "Permanite" for making joints and repairing cracks in metal articles.

A Chain of Evidence is the title of publication No. 15 ,issued by the Morse Chain Co., Ithaca, N.Y., to feature small power drives, which include drives of less than 100 h.p. The design and principal advantages of the Morse chain are dealt with fully, and a number of illustrations

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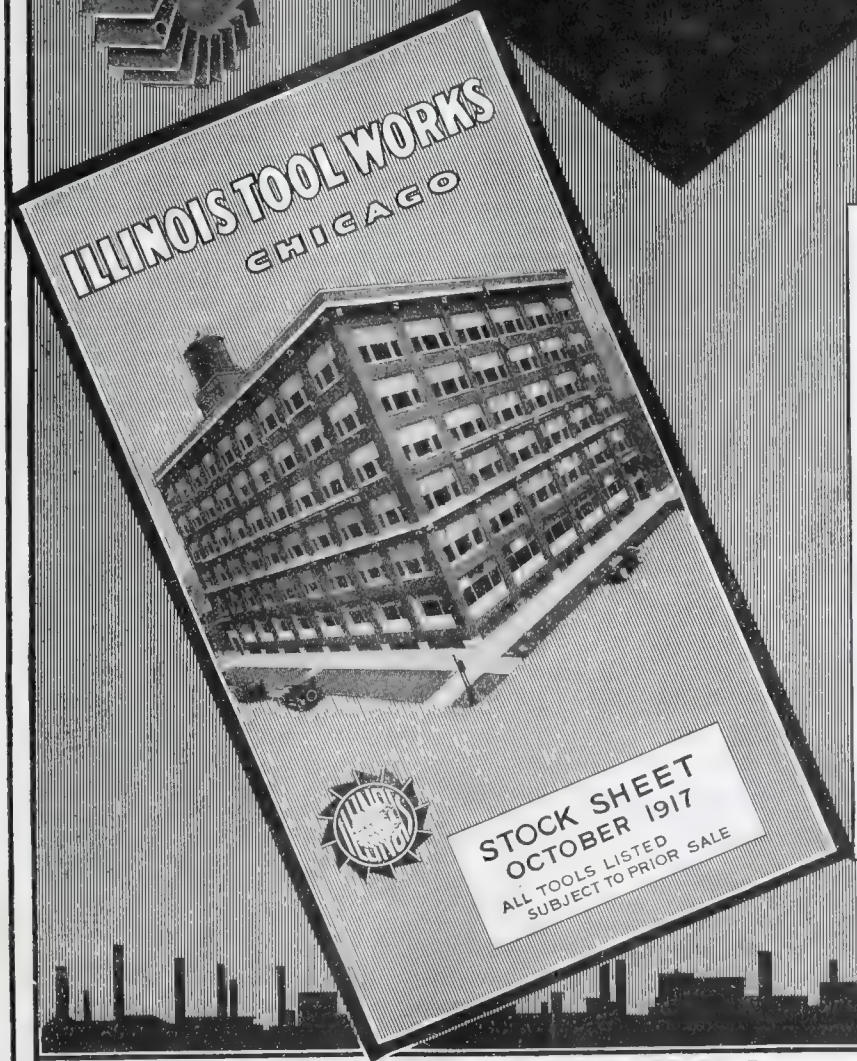

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"HAWK" D CHROME VANADIUM STEEL

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WITHOUT AN EQUAL FOR BOTH FIRST AND SECOND OPERATION PUNCHES.

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It does not stick to the work.

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Brass Castings,
Special
Machinery
Made to
Order

show different types of drive featuring the wide range of application and accompanied by particulars of each. An information blank for ordering Morse chains and a page of data to be used in the design of these drives are also included. Copies of this publication may be obtained from the Canadian agents, Jones & Glassco., Montreal and Toronto.

BOOK REVIEW

Concrete Ships is the title of a 26-page booklet, containing a number of extracts from technical journals in various countries collected by the committee on the Merchant Marine and Fisheries, for the United States Government. Those extracts deal with the use of concrete in the construction of merchant and other types of vessel. Some of the articles discuss the subject in detail and contain much useful and interesting data covering vessels built of reinforced concrete under various conditions. Copies may be obtained from the Government printing office, Washington, D.C.

"Pictures of Figures."—A remarkably interesting pamphlet has just been published by the LaSalle Extension University, of Chicago, on "Graphic Charts for the Business Man." It is the work of Stephen Gilman, C.P.A., vice-president of the Tanner-Gilman Co., public accountants. "The entire subject is only in its infancy," says Mr. Gilman, "and it may reasonably be expected that the art will be developed very extensively within the next decade. Unquestionably the enthusiasm of business men and accountants for these 'pictures of figures' is becoming greater every day." Besides a clear account of the whole process of graph making, this booklet contains 56 examples of graphs, from the simplest forms to highly elaborate charts. They include records of manufacturing costs, production, business organization, flow of materials, salaries of employees, net profits, relation of stock market to business activity, salesmen's productivity, sales, responses to advertisements, geographical distribution of customers, collections, relation of assets to liabilities, shipments, cash balances, time studies, idle time, traffic, bank deposits, complaints, telephone service, and many other things. These charts are so selected as to illustrate all the principal varieties of graphs in use at the present time. The pamphlet has been prepared for use in the Business Administration Course of the LaSalle Extension University.

U.S. GOVERNMENT FIXING STEEL PRICES

THE War Industries Board, Washington is prepared to extend Government control to the entire steel trade. The fixing of prices for plates, shapes, bars and pig iron was but the beginning, and before the board finishes there will be 150 articles of steel manufactured under fixed prices. This will be done even if Congress fails to pass the Pomerene bill providing for Government control of iron and steel products.

Should that bill become a law, the Government will have specific authority to name the maximum price for every article in the iron and steel trade, but if it does not pass, the same tactics will be adopted as were used in dealing with the four articles named. The Government will enter into an agreement with the manufacturers under which they will bind themselves to cahrge stipulated prices for all the 150 articles. These prices will apply not only to the United States Government, but to the Allies and the general public.

EFFECT OF MOUTHPIECES ON FLOW OF WATER

AN investigation has been completed by the Engineering Experiment Station, University of Illinois, under the direction of Fred B. Seely, Associate in Theoretical and Applied Mechanics, to determine the effect of mouthpieces upon the flow of water through a submerged short pipe. A knowledge of the extent of the loss of head due to contraction or expansion of a stream is of considerable importance in a variety of hydraulic problems. For example, it may be possible, through attention to the shape and angle of connections and intakes to increase the flow through the suction and discharge pipes of low head pumps, through large valves, through locomotive water columns, through the sluiceways of dams, through culverts and short tunnels, etc.

It is to be noted that losses of head due to contraction or expansion of a stream, which may in themselves be of relatively little consequence, may have a considerable influence upon subsequent losses because of the turbulent motion started by the contraction or expansion. A slight change in the conditions under which flow takes place may cause a large difference in the action or behavior of the water.

The experiments conducted by Mr. Seely involved the use of a cast iron pipe 22½ inches long and 6 inches in diameter, bored to a smooth surface. Cast iron conical mouthpieces of different lengths and angles were used. The laboratory tank employed was divided into two compartments by a vertical partition in which the short pipe was set in horizontal position.

The results of the investigation are set forth in detail in Bulletin 96 of the Engineering Experiment Station, copies of which may be obtained gratis

"Oh, dear, oh, dear-" moaned wifey, in tears. "I wish I'd taken poor mother's advice and never married you!" Hubby, the strong, silent man, swung aro" on her quickly, and at last found voice. "Did your mother try to stop you marrying me?" he demanded. Wifey nodded violently. A look of deep remorse crossed hubby's face. "Great Scott," he cried, in broken tones, "how I have wronged that woman!"

U. S. COAL OUTPUT INCREASES

ACCORDING to the United States Geological Survey all the principal coal-producing States show increases in output for 1916. The most notable increase was in Ohio, whose production of coal was 12,293,528 tons, or nearly 55 per cent. greater than in 1915. The increase in the value of the Ohio product was nearly $22,000,000, or about 91 per cent. The largest increase in quantity was in Pennsylvania—12,340,287 tons, or 7.8 per cent., compared with 1915. The increase in West Virginia was 9,276,058 tons, or 12 per cent.; in Illinois, 7,465,760 tons, or 12.5 per cent., and in Indiana, 3,087,376 tons, or 18 per cent. Iowa, New Mexico, Oklahoma, South Dakota and Texas recorded slight decreases in 1916 compared with 1915. The output of bituminous coal in 1916 established a new record in the United States as a whole, and also in most of the individual States.

U.S. EXPORT RESTRICTIONS

THE United States Government has placed export restrictions on a large number of products except when for war or directly contributory purposes. Industries in Canada not engaged in work which might be stated to be for war purposes or directly contributory thereto may suffer great hardships through the shutting off of supplies of necessary raw materials from the States. It is understood that materials required in the manufacture of agricultural implements for railway equipment and for shipbuilding will be licensed for export to Canada. The following materials are included in the list of export restrictions:

Acetone
Alcohol
Aluminum
Ammonnia salts
Ammonia nitrate
Anhydrous ammonia
Arsenate of lead
Arsenate of soda
Boiler tube (iron and steel)
Carbolic acid (phenol)
Castor oil and castor beans
Chrome nickle steel
Cyanide of sodium
Ferro-manganese
Ferro-silicon
Ferro-vanadium
Iron and steel plates, including ship, boiler, tank and other iron and steel plates ⅛ of an inch thick, and heavier and wider than 6 inches, whether plain or fabricated.
Mercury salts
Nitrate of soda
Nitric acid
Nitric salts
Phosphoric acid
Phosphorus
Pig iron
Potash and chlorate of potash
Potassium salts
Saltpeter
Scrap iron
Scrap steel
Searchlights and generators (suited for Army and Navy use)
Soldium sulphite
Spiegeleisen
Stearin and stearic acid
Steel billets
Steel blooms
Steel ingots
Steel sheet bars
Steel slabs
Sugar
Sulphate of ammonia
Sulphur and sulphuric acid
Superphosphate
Tin plate
Toluol
Tungsten
Wireless apparatus

CANADA MAY GET SOME U.S. EXPORTS

THE Department of Trade and Commerce, Ottawa, has received further information from Washington respecting the licensing of certain exports, "whose conservation is necessary on account of the limited supply and the needs of the United States in its successful prosecution of the war." Among the exports licensed are iron and steel products necessary to Canadian war and commercial

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A want ad. in this paper will bring replies from all parts of Canada.

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PORTABLE PLANERS
DRAW CUT SHAPERS
SPECIAL DRAW CUT R R SHAPERS
FINISHED MACHINE KEYS
STATIONARY & PORTABLE KEY WAY CUTTERS
SPECIAL LOCOMOTIVE CYLINDER PLANERS
OFFICE AND WORKS: MUSKEGON HEIGHTS U.S.A.

BLACK DIAMOND OVENS
OVENS
Enameling and Varnishing Ovens heated by Gas, Electricity, Steam or Coal.
Write for Booklet.
Brantford Oven & Rack Co., Ltd.
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BERTRAMS LIMITED
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PAPER MILL MACHINERY
and
MACHINE TOOLS for IRON WORKERS
Catalogues offered to Purchasers.

Scandinavia Belting
The Original Solid Woven Cotton Belt
IT CAN BE USED on all Direct Drives, whether straight or crossed.
On Shifters
On Hot Places
On Oily Places
On Dusty Places
WRITE FOR OUR FREE BELTING BOOK.
It will help you end your belting troubles.
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METAL STAMPINGS
We are manufacturers of stamped parts for other manufacturers.
We do any kind of sheet metal stamping that you require. Our improved presses and plating plant enable us to produce the finest quality of work in a surprisingly short time.
We can finish steel stamping in Nickel, Brass or Copper.
Send us a sample order.
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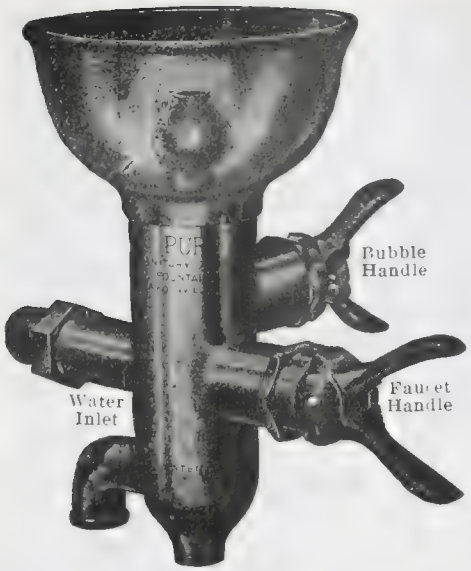

Saving or Wasting?

The manner in which you handle the drinking water problem in your plant may seem to be a small matter to you—but investigate. The results will be surprising.

The old-time faucet is costly. Running hour after hour, day after day, its ceaseless flow is costing you money, yet without any better service.

Puro Saves 35%

A Puro Sanitary Drinking Fountain will cut that water bill 35%. We can prove that it has done that for others.

It will give every employee a safe, saner draught of bubbling water free from the contamination of the common drinking cup.

In a word, it is the only sanitary Drinking Fountain that is really safe, sanitary, simple, automatic in control, and easy to attach.

"PURO - FY"

(MADE IN CANADA)
YOUR WATER SUPPLY

Puro Sanitary Drinking Fountain Company
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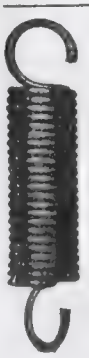

"Barnes-made" SPRINGS

are the result of over sixty years' experience in spring making, combined with unsurpassed equipment and the workmanship of men who have been with us, ten, twenty and in some cases thirty years.

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Established 1857.
THE WALLACE BARNES COMPANY
218 South St., Bristol, Ct., U.S.A.
Manfrs of "Barnes-made" Products
Springs, Screw Machine Products, Cold Rolled Steel and Wire

industries. While the Exports Administrative Board of the United States has practically prohibited the export of these articles, export licenses may be granted:

(a) When destined for actual war purposes or when they will directly contribute thereto.

(b) In certain unusual cases when such exports will contribute directly to the immediate production of important commodities required by the United States.

(c) And also in certain other cases where the articles may be exported in limited quantities without detriment to the United States.

(d) Further licenses may also be granted for limited quantities of these conserved articles when required for purely mericine or pharmaceutical purposes.

A committee of leading iron and steel men, working in connection with the Department of Trade and Commerce, has been appointed to secure information on the effect in Canada of the United States regulations. The difficulty arises chiefly in connection with industries not actually war industries, although related thereto.

Iron and steel "destined for actual war purposes" can be secured, but concerns not engaged in the manufacture of war supplies will be unable to secure the articles listed, unless the regulations are relaxed.

TRADE ENQUIRIES

THE following enquiries have been received at Ottawa by the Department of Trade and Commerce from which further particulars made be obtained.

1309. **Machinery.** — An important official body in Omsk, Siberia, is anxious to receive particulars as soon as possible with regard to the ability of Canadian manufacturers to supply machinery and appliances for the working of wool, skins, hides, grease, bone, horns, hoof, blood and other bye-products of the animal-raising industry of the Siberian steppes. Further information may be had on application. (File No. 16412.)

1310. **Electrodes.** — An important firm in Genoa has an urgent inquiry for 10 tons of either carbon or graphite electrodes, 100 mm. or 120 mm. in diameter, the length to be from 1,600 to 1,800 metres. Quotations by cable with statement of definite delivery are asked for.

1317. **Hardware.**—A Port Elizabeth firm of wholesale importers requests catalogues and discounts and prices of household and builders' hardware.

1320. **Agricultural Implements.**—A Queenstown firm of wholesale jobbers request catalogues and price-lists quoting f.o.b. Canadian ports, and full details regarding packing, on agricultural implements, tools, ploughs and other farm utensils.

1323. **Wire.**—A Queenstown firm of wholesale jobbers ask for quotations and full particulars re delivery on plain and barbed wire.

Tool Room Surface Grinder

Easily Adjusted, Strong, Accurate, Fast.

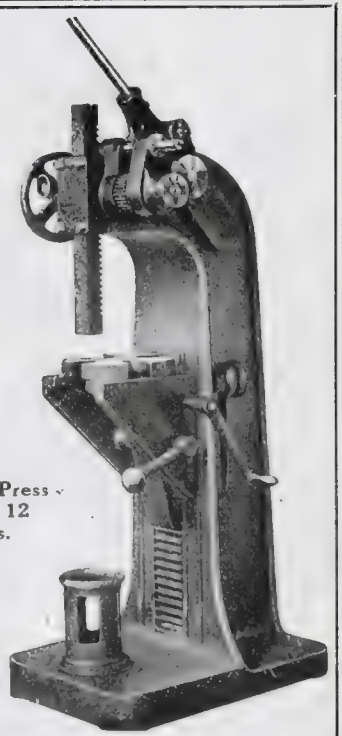
Has rigid grinding surface and large tray and water pot combined. It's an unbeatable tool room surface grinder. Tell us your machinery wants—experts on special designs. Satisfaction assured.

J. E. WING & SON, HAMILTON CANADA

ON PAGE 84

You'll find a host of Opportunities.

TURN TO IT!

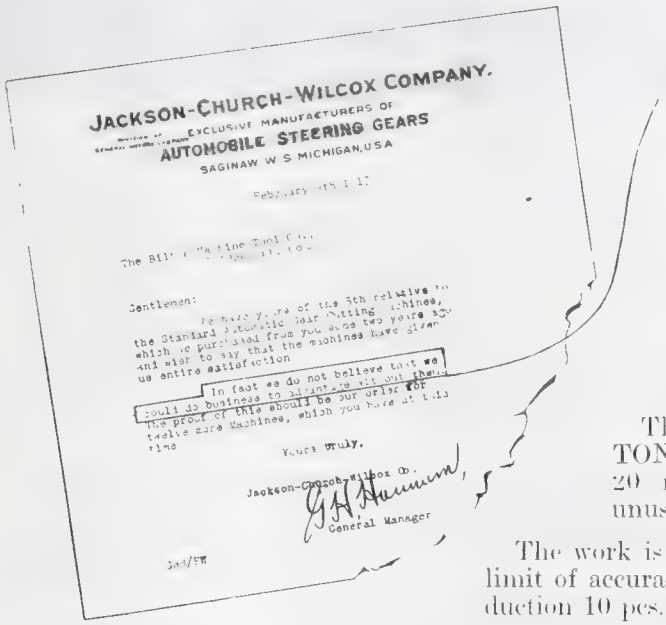


No. 4 Press - 10 to 12 tons.

Write for complete information on Atlas Arbor Presses. All sizes for all purposes.

ATLAS PRESS CO.
330 N. Park St.
Kalamazoo, Mich., U.S.A.

INDISPENSABLE!!!


JACKSON-CHURCH-WILCOX COMPANY.
EXCLUSIVE MANUFACTURERS OF
AUTOMOBILE STEERING GEARS
SAGINAW W S MICHIGAN, U.S.A.

Gentlemen:

... the Standard Automatic Gear Cutting ... which we purchased from you some two years ago ... and wish to say that the machines have given us entire satisfaction

In fact we do not believe that we could do business to advantage without them. We have placed our order for the present for twelve more Machines, which you have at this time

Yours truly,

Jackson-Church-Wilcox Co.

General Manager

"We could not do business to advantage without them."

PROOF:

"An order for twelve more machines."

Jackson-Church-Wilcox Co.

SAGINAW, MICH., U.S.A.

The best known concern making Automobile Steering Gears.

The above letter written in appreciation of "BILTON" Gear Millers is a worthy tribute. A battery of 20 machines now in operation, every one giving unusual satisfaction and saving money for this concern.

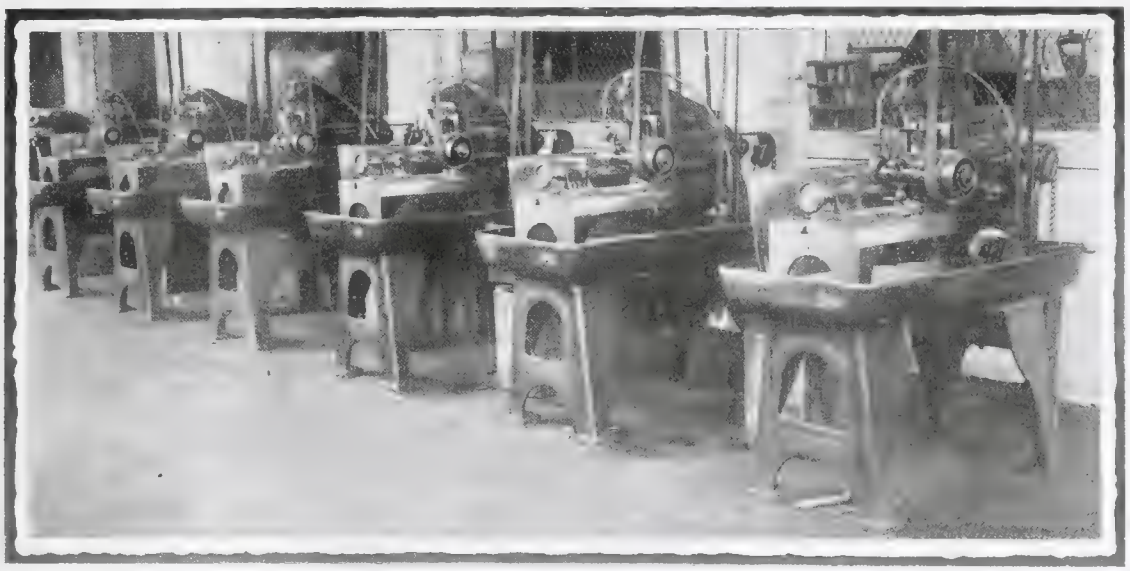
The work is milling flutes in Yoke Shaft 30-40 Carbon Steel, limit of accuracy +.001 and —.001. 36 flutes, 1½" long. Production 10 pcs. per hour.

Considering the kind of material, the number of slots and length, the output is exceptionally large.

Such a remarkable showing is common to "BILTON" Gear Millers. We can tell you of many other interesting jobs done on these machines.

Think of some milling problems, or gear cutting problems you have, and send them to us for solution.

Ask for Catalogue 30.



Foreign Agents: Alfred Herbert Ltd.; Chas. Churchill & Co., Ltd.; M. Mett Engineering Co.

The Bilton Machine Tool Company

Bridgeport, Conn., U.S.A.

MACHINE TOOLS Bilton BRIDGEPORT

If any advertisement interests you, tear it out now and place with letters to be answered.

CLASSIFIED ADVERTISING SECTION

Rates (payable in advance): Two cents per word first insertion; one cent per word subsequent insertions. Count five words when box number is required. Each figure counts as one word. Minimum order $1.00. Display rates on application.

FOR SALE

SIX COMPRESSORS FOR SALE — VERY cheap. The National Quarry, 81 St. Peter St., Quebec. c18m

A PAYING PROPOSITION FOR RAILROADS or manufacturers. Wish to sell our Canadian rights with fixtures. Address Frank Bayless, 311 Fair Street, Springfield, Ohio. c9m

SECOND-HAND 26" NEWTON TYPE COLD saw cutting-off machine, arranged for motor belt drive and complete, with or without motor. Price $600.00, cars Sherbrooke. MacKinnon, Holmes & Co., Limited, Sherbrooke, Quebec. c10m

FOR SALE—1 90-FT. THOMAS SPACING table complete, including one indicator carriage, one trolley carriage, stands, adjustable roller, racks, etc. Adjustable as to length. The Manitoba Bridge & Iron Works, Winnipeg, Man. c15m

FOR SALE—1 NEW 25 H.P. HOR. TUBULAR boiler, 1 second-hand 12 H.P. hor. tubular boiler, tested to 150 lbs.; 1 second-hand 50 H.P. loc. boiler; 1 second-hand Leonard 12 x 12 high speed engine; 1 second-hand 500-lb. belt-driven Beaudry power hammer, only in use two months; in perfect condition. Canadian Engineering & Mfg. Co., 128 Bleury St., Montreal, Que. c9m

HYDRAULIC EQUIPMENT FOR SALE—THE equipment listed below is in first-class shape having only been used about three months. Blue prints and specifications and foundations drawings will be furnished. 2—14 x 12 x 5" Fairbanks-Morse duplex steam driven high pressure pumps at 80 gals. per minute capacity each against 600 lbs. pressure, steam pressure 150 lbs. 1—Weighted Accumulator good for 1000 lbs. per sq. inch, 16" diameter, plunger 11 ft. stroke with squeezing water cushion and wooden outside bumper blocks. The tank for the weighting material surrounding the cylinder is 10' 7" in diameter and 11' 0" high. 1—Return Suction Tank for above pumps and accumulator. Height, 9' 0", diameter 8' 0". Capacity, 2700 Imperial gallons. This equipment can be shipped immediately and is open for inspection at the company's plant. Prices on application. The Canadian Copper Company, Copper Cliff, Ont. c8m

PATTERNS

THE BRANTFORD PATTERN WORKS ARE fully equipped to manufacture patterns, large or small, from blue prints, sketches or sample castings. Expert management. Prompt service. Prices reasonable. Brantford Pattern Works, 49 George St., Brantford, Ont. c13m

SPECIAL MACHINERY

H. C. THOMAS, GENERAL MACHINE SHOP, tools, jigs and machine repairs. 301 King St. W., Toronto. Telephone Adelaide 3836. tf

MANUFACTURERS—WE CAN UNDERTAKE work to any specification—munition production equipment or otherwise. Write W. H. Sumbling Machinery Co., 7 St. Mary St., Toronto

SITUATIONS WANTED

TOOL MAKER — ACCURATE, GOOD draughtsman desires responsible position. Box 330, Canadian Machinery. c14m

GRADUATE MALE NURSE, AGE 32. HAVE established hospitals for three large manufacturing concerns. Familiar with social service, accident prevention and modern methods of employing. At present employed. Less than $2,400 not considered. Box 336, Canadian Machinery. c15m

MACHINE SHOP FOREMAN DESIRES change as shop foreman or master mechanic. Acquainted with scientific management; 26 years' experience. Box 328 Canadian Machinery. c11m

A PRACTICAL MACHINE SHOP SUPERINtendent of broad experience in Canada and States wants position as superintendent or general foreman. Large or small shop on ammunition or machinery; A1 references. Address Box 327, Canadian Machinery. c9m

WORKS MANAGER OR GENERAL SUPERintendent open for engagement—28 years' experience as machinist, toolmaker, inspector, superintendent of tool-making and tool-designing, experimental and development work, heat-treating and testing of steel in raw and finished state; shop superintendent, works manager. Experience has been on rifle work, electrical work, typesetting machines, lock-making and bridge-work. Correspondence solicited, and can furnish good references. Address Box 332, Canadian Machinery. c14m

WANTED

WANTED—SMALL SECOND-HAND POWER press, in good condition. Hosmer Stamping & Die Works, Ltd., 831 Dundas St., Toronto, Ont. c13m

WANTED—SECOND-HAND POWER SQUARing shear to cut No. 10 gauge steel up to 24" wide. Must be in good working condition. Packard Electric Company, St. Catharines, Ont. c4m

SITUATIONS VACANT

MAN WANTED TO ACT AS SUPERINTENDent of a fast growing die and stamping plant in City of Toronto. Box 329, Canadian Machinery. c12m

WANTED — FOREMAN BLACKSMITH FOR Montreal shop on general work. Six forges and 1,500-lb. steam hammer. Must be a hustler. Apply, in confidence, stating experience and wages expected, to Box 335, Canadian Machinery. c15m

WANTED — MECHANICAL DRAUGHTSMAN for engine, compressor, and general work. State experience and salary expected. Apply The Jenckes Machine Company, Limited, Sherbrooke, Que. c16m

FOR SALE

4—No. 2 Foster Plain Head Screw Machines and 2—No. 3 Foster Friction Head Screw Machines all completely equipped with air cylinders and air chucks suitable for use on No. 80 Time Fuse Bodies. These machines have never been used. Also one Graduating Machine made by the American Ammunition Co.

For full particulars apply the

Holden Morgan Thread Miller Limited

Toronto, Ontario

c14m

FOR SALE

4—14 x 6 Flather Engine Lathes, C.R., Q.C.G., new.

4—14 x 5 Reed Engine Lathes, R. & F.

3—18 x 8 Davis Engine Lathes, D.B.G.

1—18 x 10 Rahn-Larmon Engine Lathe, new.

1—18 x 12 Rahn-Larmon Engine Lathe, new.

1—22" x 10' Nicholson & Waterman Engine Lathe.

1—No. 13 B. & S. Automatic Gear Cutter.

1—30" Newark Automatic Gear Cutter.

1—5 x 48 Pratt & Whitney Plain Grinder.

1—No. 2 Bath Universal Grinder.

1—12 x 60 Modern Plain Grinder, new.

2—Lees-Bradner Thread Millers.

1 30 x 30 x 8' Powell Planer, new.

Brownell Machinery Co.
Providence, R. I.

SHIPBUILDING EQUIPMENT

STEEL BUILDING (almost new) 120 x 300 ft. in two Bays with Two 10-ton WHITING ELECTRIC TRAVELLING CRANES 47 ft. span running full length of each Bay, for 3/60/550 volt service.

PLATE ROLLS

1 set NILES for 14′ 6″ plates, drop housing, belt driven.
1 set SCULLY for 12′ 0″ plates, drop housing, belt driven. Brand new.

STEAM HAMMERS

3,000-lb. MORGAN double frame, fine condition.
1,500-lb. BELL single frame, brand new.

PLANERS

62 x 62 x 20 CANADA TOOL WORKS, with 2 heads.
52 x 52 x 16 McKECHNIE BERTRAM, one head.
36 x 36 x 11 INDUSTRIAL, one head.

SHAPERS AND SLOTTERS

New 28″ GOULD EBERHARDT "Invincible."
New 24″ GOULD EBERHARDT High-duty
24″ NILES back geared crank.
24″ SELLERS slotter.
14″ INDUSTRIAL slotter.

HEAVY LATHES

26 48 x 20 McCABE double spindle.
60″ x 26 PUTNAM Triple geared.
36 x 20 NILES geared head, motor driven.
30 x 13 NILES geared head, motor driven.
25 x 10 LeBLOND heavy duty, d.b.g.
28—20 x 10 CONRADSON geared head.
27 x 16 BERTRAM heavy duty, d.b.g.

PUNCHES AND SHEARS

C.M.C. double end 18″ throat 1″ hole.
C.M.C. double end 26″ throat 1″ hole.
ROCKRIVER single 48″ throat, 1¼″ hole.
ROCKRIVER single 36″ throat, 1¼″ hole.
BERTRAM single 24″ throat 1″ hole.
BERTRAM single 18″ throat 1″ hole.
This is just a selection from our large stock —write us.

The A. R. Williams Machinery Co., Limited
64 FRONT STREET WEST TORONTO, ONTARIO

PETRIE'S LIST
of
New and Used Machine Tools
In Stock for Immediate Delivery

TURRET LATHES AND SCREW MACHINES

16″ x 5½′ MacGregor, D.B.G. (3)
16″ x 6′ Pratt & Whitney.
18″ x 6′ Prentice, high speed.
20″ x 7′ Fay & Scott.
22″ x 8′ Pratt & Whitney.
24″ x 10′ Conradson, D.B.G.
24″ x 8′ Lodge & Shipley.
26″ x 8′ Fay & Scott, B.G.
2″ x 24″ Stevens Screw Machines (2).
No. 2 Warner & Swasey, plain head.
No. 6 Warner & Swasey, friction head.

ENGINE LATHES

13″ x 6′ Filsmith, D.B.G., comp. rest.
14″ x 6′ Mulliner, B.G., comp. rest (2).
15″ x 6′ Sebastian, B.G., comp. rest (3).
16″ x 8′ McDougall, B.G., comp. rest (2).
16″ x 8′ Porter, B.G., comp. rest.
18″ x 8′ C.M.C., D.B.G., comp. rest.
20″ x 8′ New Haven, B.G., plain rest.
21″ x 8′ Bawden, heavy duty (3).
24″ x 11′ Pond, B.G., comp. rest.
25″ x 16′ Niles, B.G., turret tool post.
30″ x 10′ Ames, B.G., plain rest.

DRILLS

14″ Excelsior, sliding head, lever feed (6).
16″ Barr, sliding head, lever feed.
20″ Silver, back geared, power feed (3).
20″ Barnes, 3-spindle, lever feed.
22″ Barnes, back geared, power feed.
24″ Kerkoff, back geared, power feed.
26″ Prentice, back geared, power feed.
40″ Bickford, back geared.
46″ Allfree, back geared, power feed.
No. 10a Baush, 16-spindle.
D-1 Colburn, back geared, heavy duty.

GRINDERS

No. 1 La Salle, plain and surface.
No. 1 Cincinnati, universal (2).
No. 2 Landis, universal.
No. 2 Sellers, universal.
No. 3 Modern, universal.
No. 3 La Salle, plain and surface.
No. 190 Wells, cutter and reamer.
24″ Barnes, wet tool.
26″ Gardner, disk.

IRON PLANERS

20″ x 20″ x 5′ Bertram.
24″ x 24″ x 6½′ Bertram.
25″ x 25″ x 12′ Lodge & Davis.
36″ x 36″ x 10′ Sellers, 4 heads.
40″ x 40″ x 12′ New Haven, power feed.

MILLING MACHINES

Bertram, plain.
Brown & Sharpe, power feed, plain.
Monarch, vertical.
Van Norman, bench.
No. 2 Ford-Smith, plain.
No. 4 Fox, universal.

SHAPERS

16″ Petrie, back geared.
16″ Canada Mach. Corp., back geared.
16″ Queen City, back geared.
24″ Gould & Eberhardt, back geared.
24″ Bertram, back geared.
30″ Morton, back geared, draw cut.

MISCELLANEOUS

6″ and 12″ Racine Hack Saws.
4″ and 6′ Robertson Hack Saws.
4½″ Martin cutting-off machine.
12″ Hall Pipe Machine.
4″ Oster Hand Power Pipe Machine.
No. 2 Mitts & Merril Keyseater.
No. 2 Grant Rotary Riveting Hammer.
Nos. 1 and 3½ Greenerd Arbor Presses.
No. 4 GA. Brown & Boggs punching press.
No. 200 Brown & Boggs Inclinable Power.
No. 2 Bliss Foot-power Press.
No. 3 West Tire Setter Banding Press.
Bertram Single-end Punch and Shear.
No. 3 Dundas Double-end Punch and Shear.
7′ Geared Bending Rolls.
1500-lb. Toledo Drop Hammer.
450-lb. Williams Drop Hammer.

H. W. PETRIE, LTD.
FRONT STREET WEST, TORONTO

Complete 18-pr. Shrapnel Plant for Sale

PRINCIPAL ITEMS AS FOLLOWS:

1—Cutting-off Machine, with 15″ three-jawed chuck.
1—Lathe, 28″ swing, 8′ bed.
1—Air Chuck, Double End Rough Turning Lathe.
1—Single End Rough Turning Lathe.
1—Single End Lathe, for base roughing.
1—Single End Base Facing Machine.
1—Double End Tool Grinder.
1—Jenckes Grinder.
2—Boring Machines, C.M.C., with turrets.
2—C.M.C. Lathes, equipped for nosing and tapping.
1—22″ Davis Turret Lathe.
1—Jenckes Copper Band Lathe.
1—Gisholt Lathe, with 15″ three-jawed chuck.
1—Lo-Swing Lathe for turning profiles.
1—Tool Grinder, 24″ wheel.
1—Lathe, 14″ swing, 6′ bed.
2—Ford Smith Shell Grinders, complete.
1—17″ LeBlond Lathe, equipped for wavy groove.
1—Drill Press, fitted for screwing in sockets.
1—16″ Swing Acme Turret Lathe, for turning sockets, fitted with air chuck.
1—Double End Painting Machine, with ¼ h.p. motor.
1—Jenckes Air-operated Copper Band Press.
1—25 H.P. Canadian General Electric Motor, complete with starting box.
1—30 H.P. Westinghouse Motor, 550 volts, complete with starting box.
1—40 H.P. Canadian General Electric Motor, 2,200 volts, complete with starting box.
1—Westinghouse 40 H.P. Induction Motor, 550 volts, complete with starting box.
1—Nosing Press, for nosing shells.
1—5 H.P. Canadian General Electric Motor for same.
1—Hoskins Pyrometer.
1—Nose Furnace.
1—Tempering Furnace.

Jenckes Machine Co., Ltd.
Sherbrooke, Que.

FOR SALE

One 22″ x 50″ Wheelock Engine, left-hand, arranged for direct shaft coupling, with heavy balance wheel 8¼″ x 14″ x 17′—7″ in dia.

Merchants Rubber Factory
KITCHENER, ONTARIO
c20m

FOR SALE

New Holden-Morgan Thread Miller for nose of 6 inch British H.E. Shell.

Box 334 Canadian Machinery
c15m

Single End Punch

1—30″ Throat Ironton Single End Punch and Shear, cap. ¾ through ¾. Rectangular gear drive.

RIVERSIDE MACHINERY DEPOT
17-29 St. Aubin Ave., Detroit, Mich.

If any advertisement interests you, tear it out now and place with letters to be answered.

FOR SALE

The following used machinery, guaranteed to be in first-class condition, at lowest prices:—

2—LeBlond Heavy Duty 19" x 8' Engine Lathes.
1—Fay Scott Engine Lathe, 24" x 8', with extra turret.
1—LeBlond Engine Lathe, 17" x 6'.
1 14" x 7' Niles Engine Lathe.
1—16" x 8' Butler Engine Lathe.
1 Boring Lathe for 9.2 or 12" shells.
1—Turning Lathe for 9.2 or 12" shells.
2 No. 50 Foster Turret Lathes, 16" swing.
4—John Hall & Sons No. 4 Cutting-off Machines.
1—Wilmarth & Morman Wet Tool and Twist Drill Grinder.
1 Banfield Plug Milling Machine.
2—Otis-Fensom Bench Thread Millers.
1—Cincinnati Universal Milling Machine, No. 3 cone drive.
1—Surface Grinder.
1—Gardner Grinder, No. 4, complete with discs.
1—Gould Triplex Hydraulic Pump, Fig. 997, single acting, 1¼" x 6".
1—Holden-Morgan Marking Machine.
2—Northern Electric Co.'s Electric Soldering Irons.
1—1/15 H.P. General Electric Motor.
1—Brown-Boggs Nosing Press, No. 320.
1—Hisey Wolff Grinder, Portable Electric.
1—Dumore Grinder, Portable Electric.
8—Mech. Engr. Co. Fuel Oil Burners.
4—Mech. Engr. Co. Fuel Oil Burning Furnaces, 24" x 36".
1—Gilbert & Barker Fuel Oil Burning Furnace, 24" x 36", C-15.
6—Gilbert & Barker Fuel Oil Burners, 2".
2—Gilbert & Barker Positive Pressure Blowers, 3".
2—Canadian Buffalo Forge Co. Blowers, No. 6, 30".
1—Portable Blacksmith's Forge.
1—Circular Banding Press, suitable for 18-pdr. shells.
4—Shore Instrument Co.'s Scleroscopes.
3 Resin Pots, Simplex Electric Co.'s make.
3—Chapman Double Ball-bearing Trucks.
2—Oil Quenching Tanks, 8' long x 3' 4" wide x 2' 6" deep water jackets.
1—Bury Air Compressor, 6 x 8.
2—Brown Instrument Co.'s Pyrometers.
1—Thwing Pyrometer.
3—Fairbanks 25-lb. Scales.
1—International Time Clock for 200 men, with racks for tickets.
1 Voltmeter, Western Electric Instrument Co.'s make 0 300, model 155.

Private sale of small tools, rotary pumps, vises, pulleys, belting and shafting, etc., etc., to be held on Oct. 6th, at Midland, Ont.

For Further Information Apply to

Zenith Coal & Steel Products, Limited

MONTREAL—402 McGill Building
TORONTO—1410 Royal Bank Bldg.

c16m

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Canadian Machinery and Manufacturing News is published weekly. Representing, as it does, the industrial life and activities of Canada, it should prove of very considerable value to those who wish to buy Canadian products, and to those who may wish to sell in Canada.

As a technical journal it compares very favorably, we think, with any other high class publication, and will be found to be well worth the subscription price, and more.

If you are favorably impressed with this number, we think you will find other issues equally interesting. Canadian Machinery contains from one hundred and twelve to one hundred and seventy-eight pages—fifty-two issues in the year. We invite subscriptions from our friends abroad, and attach a coupon for the sake of convenience.

Subscription Order Form

To the Publishers,
CANADIAN MACHINERY,
143 University Ave.,
Toronto, Canada.

Gentlemen,—

You may enter our subscription to CANADIAN MACHINERY for one year, and until ordered discontinued, to be sent to address below. We enclose money order covering same.

Yours truly,

Name .....

Full address .....

City ..... County .....

The subscription price to Great Britain and her colonies is 12s. 6d. United States, $3.50, other countries 16/- per year.

Eastern Machinery & Equipment Co., Inc.

319 COMMERCIAL TRUST BUILDING PHILADELPHIA, PA.

NEW TOOLS FOR IMMEDIATE DELIVERY.

4—12" x 36" Bridgeport Grinders.
1—2½ x 3" Wm. Sellers Tool Grinder.
30—18" x 9' Turning and Boring Lathes.
3—26 x 14' Am. Patt. Eng. Lathe
3—Double head Sullivan Grinders.
1—32" x 12' Pittsburgh Engine Lathe.
1—20" Ohio Shaper.

USED MACHINERY
ENGINE LATHES.

4—New 36" x 25' Wickes Engine Lathes, quick-change gear, double back gear.
8—30" x 10' American Gear head A-1.
5—20" x 8' Lodge & Shipley, geared head, q.c.g.
1—20" x 10' Bullard.
1—24" x 6' Bullard.
3—24" x 14' American.

TURRET LATHES.

9—18" x 5' Warner & Swasey Hexagon Turret, geared friction head.
36—Potter & Johnson 6A Automatic Turret Machines.
3—3 x 36 Jones & Lamson Flat Turret.
2—2¼" x 24" Jones & Lamson Flat Turret, bar equipment. Full set Turret Tools.
9—25" Gisholt 12" Collet chuck 1⅝" hole in spindle threading lathe.
3—26" Putnam heavy duty lathe.
—14" x 6' Lodge & Shipley Turret Backgeared.
5—24" Gisholt 2 step cone, 6¼ H.S.

BORING MILLS.

1—Binsse Horizontal Boring Mill, 3" bar.
6—66" swing Bement-Miles Tire Turning Mills, two swivel heads—15½" under rail.
1—37" Baush Boring Mill, 2 heads, good as new.
1—Cylinder boring mill, capacity of 24" diam. to 96" diam. 10' long.
Tool equipment included, good as new.
1—42" Bullard Boring Mill (2) heads.

MILLING MACHINES.

1—No. 3 LeBlond Plain Miller, table 13½ x 58¼.
1—No. 2 Kempsmith, table 10' x 45".
1—24" x 8' Beaman & Smith Open Side Slab Miller, with two vertical spindles.
1—No. 1½ Universal Milling Machine.

GEAR CUTTERS.

1—24" Fellows Gear Shaper.
2—36" Fellows Gear Shapers.

SCREW CUTTING MACHINES.

1—2" Cleveland automatic.
1—No. 55 National Acme 4 spindle, good as new.
1—No. 54 National Acme 4 spindle, good as new.

SLOTTERS AND SHAPERS.

1—9" Bement Slotter.
1—12" Bement Slotter.
1—20" Wharton Slotter.
1—20" Gould & Eberhardt Shaper. B.G. Vise, C.S.
1—16" Steptoe Shaper.

GRINDERS.

8—12" x 36" Bridgeport.
1—1½" Full Universal Landis Machine.
1—No. 13 Brown & Sharpe Universal and Tool Grinder. Full equipment.
No. 1½ Universal Cutter and Reamer Grinder.
1—28" Bridgeport Face Grinder, with magnetic chuck.
5—Fisher Profile Grinders for Cutters.
1—No. 28 Brown & Sharpe Plain Grinder, 17" x 96".
5—No. 6 Std. Universal Tool & Cutter Grinders.

DRILL PRESSES.

1—24" Bickford Upright back gear sliding head lever and wheel feed drill.
1—4' Bickford Radial, with Tapping attachment, motor drive, with motor.

WANTED

Hendey Lathe, 14" swing 6 ft. bed, with taper and standard attachments.

No. 2 Cincinnati or B&S Universal Milling Machine.

Sensitive Drill, must be in good condition.

Box 333
CANADIAN MACHINERY

c14m

NOW!

You've been going to send in that ad for weeks, so why not mail it now for next week's issue?

CANADIAN MACHINERY
Classified Advertising Section
143-153 University Ave. Toronto

GOOD USED EQUIPMENT

OVERHEAD TRAVELING CRANES

20-Ton, 56' 3" span, three motor, 110 volts, D.C.
25-Ton trolley, three motor, 220 volts, D.C.
10-Ton, 40' span, 80' lift three motor.
10-Ton P. & H., 40' 10" span, three motor.
5-Ton, 47' 0" span, three motor, 220 v., D.C.
Crane Motors, 10 and 4½ H.P., 220 V., D.C.
10-Ton hand crane, 56' 0" span.
20-Ton hand crane, 29' 6" span.
2 Ton hand cranes, 22' span.

PUNCHES AND SHEARS

Lever Shear (double), cap. 2" sq.
28" throat (single), cap. ⅞x⅞" (belt).
48" throat (single), cap. 3x1¼" (steam).
16" throat (single), cap. 1½x1½ (belt).
36" throat (single), cap. ⅞x⅞" (belt).
15" throat (single), cap. ¾x½" (hand).
10" throat (double), cap. 1½x1" (belt).
Squaring Shear, 53" cap., 14 gauge.
Angle Shear (double), cap. 6x6x¾" (belt).
Plate Shear (Univ.), 18" blade, cap. ¾".
Rotary splitting, 36" throat, cap. ½".
Rotary bevel, 5" throat, cap. ½".
Guillotine, Perkins, No. 6, cap. 2½" sq.
Butterfly shear for light scrap.

MISCELLANEOUS.

Ajax Bolt Header and Upsetter, 2½" cap.
Acme Bolt Header and Upsetter, 1½" cap.
Bulldozer, No. 12 Ajax, 30" stroke.
Bending Roll, 6', drop end, 6½ and 8" rolls.
Lathe, 24"x10' American, latest.
Grinder, No. 10 B. & S. Plain.
Grinder, No. 13, B. & S. Universal and Tool.
Rotary Planer, 36", Cleveland No. 2.
Saw, cold, 26" blade, 48" travel.
Press (trimming) No. 11 Perkins, 16,500 lbs.
Rolling Mill, 1 stand, 2 high, 30" bet. housings.
First-class condition—quick shipments.

McCoy-Brandt Machinery Co.
Office and Warehouse:
216-218 Penn Ave., Pittsburgh, Pa.

The Cost is Trifling

It will cost you very little to adequately tell your wants in this section. Send in your copy to-day for next week's issue.

CANADIAN MACHINERY
Classified Advertising Section
143 University Avenue, Toronto

RIVERSIDE Machinery List

We Own Every Tool Offered

ENGINE LATHES.

1—28 x 10 Hamilton Standard Engine Lathe, with turret.
1—22 x 14 Putman Standard Engine Lathe.
1—22 x 10 Reed Standard Engine Lathe.
1—22 x 8 Reed Standard Engine Lathe.
5—18 x 8 New Springfield Engine Lathes.
1—18 x 6 Jones & Lamson Standard Engine Lathe.
1—16 x 8 New Springfield Engine Lathe.
1—16 x 8 Potter Standard Engine Lathe.
2—16 x 8 Reed Stud Lathes.
1—14 x 8 Sebastian Standard Engine Lathe.
1—14 x 6 Springfield Engine Lathe.
1—14 x 6 Prentiss Engine Lathe.
1—14 x 6 Sebastian Engine Lathe.
2—14 x 6 Van Werk Engine Lathes.

TURRET AND SCREW MACHINES.

2—No. 6 A Potter & Johnston Automatic Lathes.
1—24 x 24 Jones & Lamson Flat Turret Lathe, S.G.H.
1—2 x 24 Jones & Lamson Flat Turret Lathe, cone head.
1—No. 4 F. G. H. Foster Hand Screw Machine.
1—No. 4 Smuir & Kamen Hand Screw Machine.
1—No. 5 Pierson F. G. H. Hand Screw Machine.
4—New 14" Pierce Turret Lathes.
2—New 1 x 8 Pierce Hand Screw Machines.
2—2" Cleveland Automatic Screw Machines, jigger feed.

MILLING MACHINES AND GRINDERS.

1—No. 2 Hendey Plain Milling Machine.
3—New No. 1½ American Plain Milling Machine.
1—No. 13½ Garvin Plain Milling Machine.
1—No. 0 Brown & Sharpe Plain Milling Machine.
1—No. 1 Cincinnati Plain Milling Machine.
2—No. 13 Pratt & Whitney Lincoln Type Milling Machines.
5—No. 1½ Knight Milling and Drilling Machines.
3—Fox Hand Milling Machines.
1—Garvin Hand Miller.
4—New No. 0 Burke Bench Mills.
1—No. 2½ Bath Universal Grinder.
1—No. 2 W. & M. Surface Grinder.
1—No. 3 W. & M. Surface Grinder.
1—Miami Valley Universal Cutter Grinder.

DRILL PRESSES.

1—5' Mueller Plain Radial Drill, old type.
1—20" Baker H. D. Drill.
5—20" Buffalo Plain Drill Presses.
1—3-spindle 8" overhang Henry & Wright High speed Drill.
4—6-spindle Fox High Speed Drills.
2—4-spindle Fox High Speed Drills.
1—16-spindle Natco Drill.
3—12" Leland & Gifford High Speed Bench Drills.

SHAPERS AND PLANERS.

1—24" Lodge & Davis Geared Shaper.
1—18" Hendey Geared Shaper.
2—16" New Springfield B.G. Crank Shapers.
1—27 x 27 x 8' Cincinnati Planer, S.H.
1—16 x 16 x 5' Hendey Planer, S.H.

PRESSES AND HAMMERS.

1—Waterbury Farrel O.B.I. Press, geared.
1—No. 10 Perkins Drawing Press.
5—No. 2-W Bliss Wiring Presses.
1—300-lb. B. & S. Roll Board Hammer.
1—300-lb. P. & W. Roll Board Hammer.
1—25-lb. Fairbanks Belt Hammer.
1—25-lb. Bradley Helve Hammer.

AIR COMPRESSORS.

1—16 x 18 x 12 Union Steam Pump Co. Steam Driven Air Compressor.
1—8 x 6 Westinghouse Steam Air Compressor.
1—10 x 10 Clayton Belt-driven Air Compressor.
1—8 x 8 Fairbanks Morse Electrical-driven Air Compressor.
1—8 x 8 Gardner Single Belt Driven Air Compressor.
1—8 x 8 Union Steam Pump Co. Belt-driven Air Compressor.

We also carry a large stock of Steam Engines, Steam Pumps and Electrical Equipment of all kinds.

We are in the market to purchase machine tools, both large and small.

RIVERSIDE MACHINERY DEPOT
17-29 St. Aubin Avenue
DETROIT, MICH.

If any advertisement interests you, tear it out now and place with letters to be answered.

New York's Greatest Stock

(Partial List)

SHAPERS

NEW 24″ HOLLINGWORTH IMPROVED TRIPLE GEARED CRANK SHAPERS.

PLANERS

60″ x 60″ x 28′ Betts Planer, two heads.
55″ x 46″ x 14′ Lincoln, four heads.
48″ x 48″ x 12′ Niles, two heads.
32″ x 32″ x 10′ Pond.
30″ x 30″ x 8′ Pease, two heads.
Two—28″ x 28″ x 7′ New Haven.
26″ x 26″ x 8′ Niles.
26″ x 26″ x 6′ Hendey.

LATHES

60″ Fifield, 9′ centers, face plate drive.
60″ x 20′ New Haven, face plate drive.
48″ x 16′ Niles Tire or Car Wheel, double head type, face plate drive, triple geared.
36″ x 20′ New Haven, compound rest, power cross feed, 14′ 6″ between centers.
36″ x 16′ Bradford, compound rest, power cross feed.
36″ x 14′ Putnam, heavy duty, triple geared, face plate drive.
42″ x 19′ Putnam, heavy duty, triple geared, face plate drive, raising blocks to swing 54″.
30″ x 28′ Fifield, compound rest, power cross feed.
30″ x 16′ Fifield, raising blocks to swing 38″, compound rest, power cross feed.
28″ x 17′ New Haven, raising blocks to swing 30″, hollow spindle, full swing rest, compound rest, power cross feed.
24″ x 24′ Fitchburg, raising blocks to swing 30″, compound rest, power cross feed, 19′ between centers.

BENDING ROLLS

No. 1 Hilles & Jones Straightening Rolls, 5′ 2″ between housings.
Ship Plate Bending Rolls, 9′ 2″ between housings.
Ship Plate Bending Rolls, 5′ 10″ between housings.
Niles double geared Bending Rolls, drop end housing, 40½″ between housings.

GEAR CUTTERS

Four 48″ Newton Automatic Spur Gear.
40″ Flather Automatic Spur Gear.
36″ Brown & Sharpe Automatic Hob and Spur Gear.
24″ Brown & Sharpe Automatic Spiral Gear.
24″ Gould & Eberhardt Spur and Bevel Gear.
24″ Whiton Automatic Spur and Bevel Gear.
24″ Brainard Automatic Spur.
Two No. 12 Brown & Sharpe Automatic Spur and Bevel.
19″ x 5″ Less Grant Automatic Spur and Spiral.

New York Machinery Exchange, Inc.

50 Church Street . · . New York City

MACHINE TOOLS IN STOCK

No. 4 Cincinnati Universal Miller with vertical attachment and power feed Rotary Table.
No. 3 LeBlond Universal Miller.
No. 1½ NEW American plain Millers.
5—No. 0 NEW Steptoe Hand Millers.
1″ x 15″ Pratt & Whitney Screw Machine.
28″ x 16′ Reed Lathe.
24″ x 10′ NEW Carroll-Jamieson heavy duty lathe.
20″ x 6′ Davis lathe.
20″ x 10′ Hamilton lathe.
6—19″ x 8′ NEW, Sidney D.B.G. quick change lathes, swing 21″ over V's.
3—17″ x 8′ NEW, Sidney D.B.G. quick change lathe, swing 19″ over V's.
15″ x 6′ NEW, Sidney D.B.G. quick change lathe, swings 17″ over V's.
12—17″ x 8′ NEW, National quick change.
15″ x 6′ NEW, Carroll-Jamieson, quick change.
48″ Harrington plain Radial Drill.
36″ Dresses plain Radial Drill.
D-4 Colburn high duty Drills.
3—20″ Rockford high duty Drills.
16″ Queen City B.G. Shaper.
400 lb. Single Frame Steam Hammer.
125 lb. Dupont Belt Hammer.
30 Ton Watson & Stillman Hydraulic Press.

FRANK TOOMEY, INC.
127-131 North Third St., PHILADELPHIA, PA., U.S.A.

We Have for Immediate Delivery the Following Second-hand Machinery in Good Operative Condition

1 Landis No. 3 Universal Grinder 12″ x 42″, complete equipment, less internal grinding attachment. .$1,500

1 Gisholt Turret Lathe, 21″, complete with boring bar equipment and countershaft $2,200

1 Gisholt Turret Lathe, 21″, complete with boring bar equipment and countershaft $1,800

These machines are particularly good value, and may be seen at our works.

A. B. JARDINE & COMPANY
HESPELER, ONT.

STOP—MAYBE IT'S HERE

BORING MACHINES—Vertical.

1—30" Flather, one turret head
2—36" B. & S. one turret head, Dec. Delivery
1—38" Baush, two heads.
1—38" Niles, two swivel heads.
1—42" McCabe, one swivel head
1—51" Niles, two swivel heads, motor driven
1—84" Bickford.
1—72" Niles, 2 swivel heads
1—90" Vertical Cylinder
1—NEW 8' Bickford
1—Niles, 10' 16' extension, two heads.

BORING MACHINES—Horizontal

1—Lucas 2¾" bar
1—24" Cleveland, 2½" bar, takes 4' 6", compound table.
1—No. 1 Barrett Cylinder Borer, 3¾" bar type.
1—Betts Knee Type, 3" bar.
1—No. 2 Barrett Cylinder, 5" bar.

BULLDOZERS

1—No. 8 Ajax, motor driven.
1—No. 9 Williams & White Belt Drive
1—No. 12 Ajax, single pulley drive.
2—No. 23 Williams & White, belt drive.
1—No. 29-U Williams & White, arranged for motor drive.

CRANES

1—Case 5-ton, 47' span.
1—50-ton Niles, 61' span.
Locomotive, 35' boom, standard gaged, steam driven, 13 ton.

CUTTING-OFF MACHINES

2—NEW 4½" Davis.
30—Davis 4½"
10—4½" Williams.
2—NEW 6" Davis.

DRILLING MACHINES—Radial

2—NEW 2' American cone drive
6—NEW 3' Mueller, speed box drive, Dec. del.
1—3' Bickford Semi-Universal table
3—NEW 3' American, sensitive tapping attachment.
1—NEW 3' Mueller, plain speed box drive
1—NEW 3½' Western Drill, 86" circle.
2—4' Mueller Plain, speed box drive
1—4½' Bickford, plain.
1—5' Dreses, full universal, gear box drive.
1—5' Fosdick, plain.
6—NEW 5' Mueller, speed box drive, Dec. del.
1—5' Baush Radial; arranged for motor drive
1—NEW 6' Triumph Motor Drive, Oct. delivery.

DRILLING MACHINES—Heavy Duty

4—No. 310 Baker Single Pulley Drive, late type
2—NEW No. 2 Colburn
3—No. 14 Colburn, 24" swing, capacity 2" in solid steel.

DRILLING MACHINES—Sliding Head.

2—NEW 24" Barnes Drills and Tappers.
5—NEW 24" Barnes Drills.

DRILLING MACHINES—Multiple Spindle

1—No. 5 Fox, 12-spindle, capacity 1".
1—14-spindle Baush, capacity 1" holes, 36" circles.
Baush, 12-spindle, capacity 1¼", 30" circle, motor drive.

DRILLING MACHINES—Sensitive.

2—NEW 12" Albany High Speed Tool Room.
2—NEW No. P 4 Allen, one spindle.
1—NEW No. P-2-S Allen, two spindles.
2—NEW No. B 1 Allen, one spindle, 7" overhang.
1—NEW No. B-2 Allen, two spindle, 7" overhang.
4—NEW No. B-3 Allen, three spindle, 7" overhang tapping attachment.
3—NEW No. B-4 Allen four spindle, 7" overhang

GEAR CUTTING MACHINES

1—NEW No. 3 Bickett Gear Rack Planer, delivery 60 days.
1—No. 3 Brown & Sharpe Auto. Gear Cutter spur
1—NEW 6" Standard Gear Cutter, spur.
1—15" Gleason Bevel Gear Planer
1—16" Bilgram Bevel Gear Generator.
1—24" Becker-Brainard.
1—24" x 8" G. & E. for spur and bevel
1—24" Fellows Gear Shaper
2—NEW Flather Solid Pattern 30" Automatic Gear Cutter.
3—36" Fellows Gear Shapers.

GRINDERS—Universal, for Cutters, Drills, Reamers, etc.

8—NEW No. 190 Wells.
2—NEW No. 1 Wood Universal
1—NEW Wilmarth & Morman, Style B.K.
1—NEW Walker, No. 1 Outfit B
5—NEW No. 2 Wood Universal
1—NEW Walker, No. 2 Outfit K capacity 9" x 26")
1—NEW Norton No. 1
2—NEW No. 2 Osterlein Universal.
1—NEW LeBlond
1—NEW Gisholt Universal

GRINDERS—Cylindrical—Plain

1—NEW No. 12 B. & S., 8" x 26". Oct. del.
2—NEW 8" x 18" Modern, self-contained.
3—NEW 8" x 30" Modern, self-contained.
2—NEW 12" x 24" Modern, self-contained.
6—NEW 12" x 36" Modern, self-contained.
3—NEW 12" x 48" Modern, self-contained.
2—12 x 42" Landis, self-contained.
1—NEW 10" x 50" Norton, Oct. delivery
1—14" x 50" Norton.
1—NEW 12" x 60" Modern, self-contained.
1—NEW 10 x 72 Norton, plain.

GRINDERS—Cylindrical—Universal.

2—NEW No. 2 Bath, 9" x 20".
1—NEW No. 2 Walker, 9" x 26"
1—Brown & Sharpe No. 13—8" x 24"
1—NEW No. 2½ (10" x 36") Bath
1—NEW No. 3 (12" x 40") Brown & Sharpe.
1—12" x 42" Landis
2—NEW No. 3 Modern, 13" x 40". Oct. del.
1—No. 4 Cincinnati, capacity 12 x 72"

GRINDERS—Internal

1—NEW No. 6 Modern, capacity 10" x 10".
1—No. 70 Heald
2—No. 76 Heald.

GRINDERS—Cylinder

1—No. 60 Heald, single pulley drive

GRINDERS—Profile

1—NEW Cleveland
5—Fisher Profile Grinders.

GRINDERS—Surface

1—NEW No. 1 Wilmarth & Morman
2—NEW No. 1½ Walker's complete
2—NEW No. 2 American with Walker No. 1¾ plain flat mag. chucks.
4—NEW No. 2 Reid (same as B. & S.)
1—NEW No. 2 Brown & Sharpe.

HAMMERS—Board-Lift, Drop.

1—Used No. 4 Standard Machinery Co., 400 lb.
1—Used E. W. Bliss, 800 lb.

HAMMERS—Steam Forging

Morgan & Williams, 600 to 800 lbs., 21" gap
1—3,000 lbs. Morgan Double Frame
2—3,500 lbs. Chambersburg Steam Drop Hammer.
2—5,000 lbs. Chambersburg Steam Drop Hammer.
1—7,000-lb. Morgan Special Double Stand.

KEYSEATERS

2—NEW No. 1 Davis.
1—NEW No. 2 Davis.
1—No. 2 Mitts & Merrill.
1—No. 2 Knowles, 60" stroke.

LATHES—Manufacturing, Not Screw Cutting.

2—NEW No. 3 Harding Bros.' Bench Lathe.
3—16" x 8' Fairbanks-Morse, heavy duty.
70—NEW Simplex, 16" x 8'.
14—Reed-Prentice Shell Lathes for 4" or 18 lbs. American shells.
22—18" x 8' Battle Creek, heavy-duty.
5—20" x 10' Hindman, high, duty.

LATHES—Engine

8" Wade Precision, October delivery.
3—NEW 14" x 6' Bradford, quick change.
1—NEW 14" x 8' Champion.
14—NEW 15" x 6' Rockford.
4—NEW 16" x 8' Bradford, quick change.
3—NEW 16" x 6' Cleveland Tool Room Lathes, complete equipment
1—NEW 17" x 8' National, quick change gears.
12—17" x 8' LeBlond, pan bed, quick-change gears
1—18 x 10 Hendey quick-change gear, 14" chuck
1—NEW 19" x 8' LeBlond heavy duty
3—NEW 20" x 12' Bradford, quick change.
5—NEW 20" x 10' Bradford, quick change.
1—NEW 20" x 10' Cleveland Geared Head
19—NEW 21" x 10' Porter, S.B.G.
9—22" x 10' Putnam oil pan turrets
1—NEW 24" x 10' Bradford, quick change.
5—NEW 24" x 12' Bradford, quick change.
1—NEW 24" x 14' Bradford, quick change.
3—24" x 14' American, quick change
1—24" x 24' Perkins, single back-geared, raising blocks to 40", 18" chucks.
1—28" x 18' S. & B.
1—NEW 30" x 14' American Double Back-Geared, Quick-Change
3—NEW 32" x 12' Pittsburg Pattern
1—32" x 12' 6" Rahn-Mayer-Carpenter, taper attach
8—NEW 36" x 24' Putnam, triple-geared
1—38" x 18' Schumacher & Boye, triple geared, quick change.
1—50" x 12' American Gear Head, quick-change
1—50" x 24' Prentiss
1—71" x 20' Fifield, triple-geared.

LATHES—Turret

1—NEW 13" Gisholt, G-13.
1—NEW 21" Gisholt, H-21.
2—NEW 21" Gisholt, I-24.
9—2¼ x 26" Greenlee Flat Turret Lathes
5—2 x 24" Jones & Lamson
1—21" Libbey, universal facing head, three jaw chuck.
18—6-A Potter & Johnson.
1—NEW 18" Libby.

MILLING MACHINES—Knee Type—Universal

1—NEW No. 1 Kempsmith.
1—No. 2 Kempsmith, 13" dividing head.
1—No. 2 Kempsmith, vertical attach.
1—No. 2 LeBlond.
1—NEW No. 2 Hendey.
1—NEW No. 2 Rockford High Power.
1—NEW No. 3 Kempsmith
3—NEW No. 3-H LeBlond
1—NEW No. 3 Hendey.
1—NEW No. 4 LeBlond, heavy duty, immediate.

MILLING MACHINES—Knee Type—Plain

9—NEW No. 0 Rockford.
1—NEW No. 1-B Hendey.
2—NEW No. 1 Kempsmith.
2—NEW No. 1½ American back gear
1—NEW No. 1 Rockford, high power.
2—NEW No. 2 Rockford
1—No. 3 LeBlond
1—NEW No. 3 Kempsmith.
1—NEW No. 4 LeBlond.
1—No. 4 Brown & Sharpe

MILLING MACHINES—Hand.

3—NEW No. 1 Rockford, without column.
3—NEW No. 2 Rockford, on column.
2—NEW No. 3 Rockford, on column.
3—NEW No. 3 Rockford, on column power feed.

MILLING MACHINES—Vertical

1—NEW Bickett, No. 0
4—NEW No. 4-B Becker
2—No. 5 Becker.

MILLING MACHINES—Planer Type

1—No. 2 Beaman & Smith Vertical Spindle, open side.
1—Ingersoll Slab, 16" x 48" cap.
1—NEW 17" x 5' Eynon, planer type.
1—Bement-Niles, heavy duty planer type, 24" x 24" x 12'.
2—Ingersoll Slab Millers, working surface of table 60" x 20"

MILLING MACHINES—Lincoln Type.

3—NEW No. 1 American.

PLANERS

24" x 24" x 8' Cincinnati, one head, used three months
2—NEW 30" x 30" x 8' Cincinnati Medium Planer, one head.
1—30" x 30" x 8' Ohio Machine Tool Co., 2 heads.
1—36" x 36" x 10' American, two heads.
1—40" x 40" x 11' Niles, four heads
1—Gray 42" widened to 56" x 42" x 16', two heads
1—NEW 48" x 48" x 19' Cincinnati, two heads.
1—38" x 12' Pedrick, open side, one head.
1—50" x 50" x 16' Pond, 2 heads on rail
1—52" x 52" x 16' Betts, 2 heads, right angle drive.
1—54" x 42" x 16' Gray; 2 heads on cross rail; one side head.
1—36' Niles Plate Planer, extra heavy, almost new, arranged for motor drive.

SCREW MACHINES—Hand.

4—NEW No. 2 Foster, geared friction head.
1—NEW No. 4 Foster, geared friction head, power feed to turret slide.
2—NEW No. 5 Foster, all geared, power feed to turret slide.
3—NEW No. 5 Foster, all geared head, power feed to turret; power cross feed.
2—NEW No. 6 Foster, geared friction head, power feed to turret, power cross feed.
5—NEW No. 7 Foster, geared friction head, power feed to turret, power cross feed.
2—NEW No. 10 Foster, geared friction head, power feed to turret, power cross feed.
2—NEW 2¾" Dreses, F.G.B., power feed.

SCREW MACHINES—Automatic

2—NEW ⅝" Cleveland, Model A.
1—NEW ¾" Gridley Mult. Spindle, belt driven
2—NEW 1¼" Gridley Mult. Spindle, belt driven.
1—NEW 2¼" Gridley Mult. Spindle, belt driven.
1—NEW 3¼" Gridley Single Spindle, belt driven.
2—No. 63 National Acme
1—No. 55 National Acme.
1—No. 515 National Acme.

SHAPERS

1—NEW 16" Springfield
1—16" Motor Driven Rockford
1—NEW Barker 24"
1—NEW 24" Milwaukee.
2—25" Smith & Mills, Back-Geared
1—28" Smith & Mills, Triple-Geared
2—30" Morton Draw Cut.

SLOTTERS

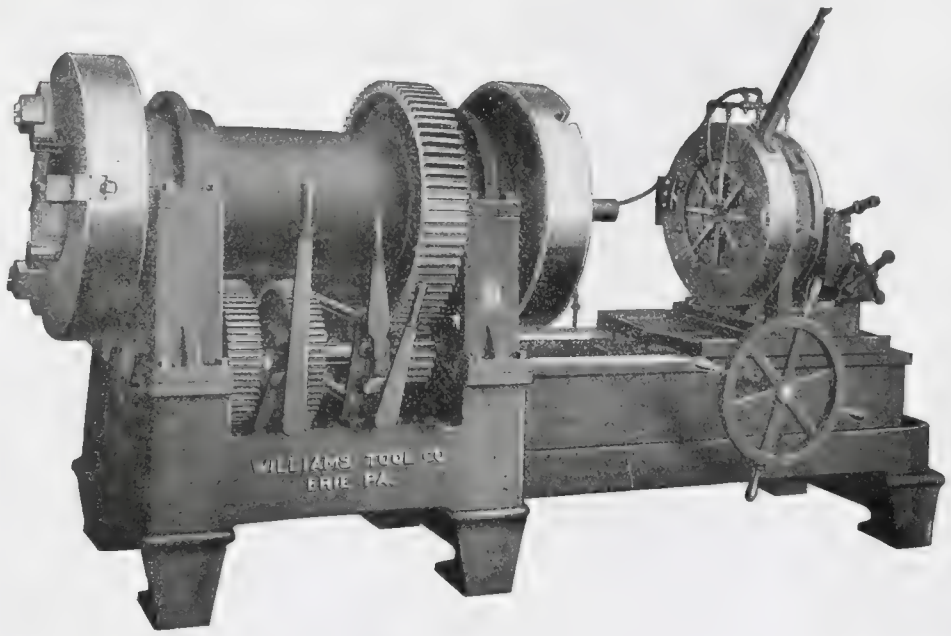
1—NEW 8½" Betts, heavy model, vertical geared crank slotter.
1—NEW 12" Betts, belt drive
1—18" Betts, heavy duty

W. F. DAVIS MACHINE TOOL COMPANY

CHICAGO, ILL. 549 Washington Blvd. | CINCINNATI, OHIO 1018 Union Central Life Bldg. | CLEVELAND, OHIO 508 Leader News Bldg. | NEW YORK CITY Singer Bldg.

WRITE OR WIRE OUR NEAREST OFFICE FOR QUOTATIONS
THIS IS ONLY A PARTIAL LIST OF AVAILABLE MACHINES

A One Thousand Dollar Bargain



No. 5 New Model Pipe Cutting and Threading Machine, used on two jobs only.

Complete with direct connected electric motor.

Specification

Will cut, thread and ream, 2½ inch. to 12 inch. pipe inclusive, and make nipples.

550 volts, 5 H.P. Motor, A. C. current, 5.2 Amperes.

Better than new. Only used on two jobs. Will sacrifice for quick sale and reasonable terms.

Can ship at once.

Drop us a line for full particulars.

J. R. Devereux & Company

233 ST. JAMES STREET, MONTREAL

Fuse Plant For Sale

The entire equipment, with a daily capacity for producing 10,500 complete sets of parts for time fuses, is offered subject to prior sale.

Williams Manufacturing Co. Limited

MUNITIONS DEPARTMENT

1789 St. James St. - Montreal

We Have For Sale the Following Machines

At Plant of Canada Malleable Steel & Range Co., Oshawa, Ont.

1—No. 27 Double Floor Grinder—Canadian Hart Wheel make. Equipped with two 12″ wheels and two spindles 33″ long. Shaft bearings 24″ long	$100	21—Heavy Gringer, same as No. 20. No wheels	$ 50
2—Heavy Blount Double Floor Grinder, 45″ spindle, two 8″ wheels	100	22—8-Wheel Robinson Detroit Grinder	825
3—Heavy Petrie Floor Grinders. No rest or c/s. Shaft 36″ long, two 9″ wheels	50	23—60″ Steel Plate exhaust for 23″ L.H.B.H. discharge	85
4—Stouffville Floor Grinder. No rest or c/s. Shaft 32″, two 8″ wheels	30	24—Anvil, 154-lb.	15
5—Large Polishing Stand (new). 4′ shaft. Bearings 1¼″ x 6	35	27—5 H.P. Vertical Boiler, Submerged tubes, and one Steam Pump 3 x 2 x 3	125
6—Brown & Boggs Lever Splitting Shear	50	28—Revolving Electric Plating Machine	140
9—Hanson & Van Winkle Polishing Stand (no c/s)	75	29—Platers Electric Dynamo 600 Amperes	200
11—Hanson & Van Winkle Polishing Stand. Shaft 5′, Bearings 2¼ x 12″	60	30—Tumbling Barrel, 18″ x 4′	50
15—No. 7 Jarecki Pipe Machine, 1¼″	150	32—No. 23 Brown & Boggs Hand Punch and Shear	60
18—Brown & Boggs 6′ 6″ Power Shears	450	35—Fairbanks Scale, 5-Ton	75
19—No. 21 Crosby Punch Press, Inclinable	350	36—Hand Former, Toggle Type	15
20—Heavy Grinder, Bearings 2¼ x 12″—cross adjustment slide, one 12″ wheel	50	31—15 H.P. Westinghouse, 550 volt, 60 cycle, 3 phase, 1,120 R.P.M.	325
		33—40 H.P. Westinghouse, 550 volt, 60 cycle, 3 phase, 850 R.P.M.	600
		34—3 Westinghouse Transformers, 30 kw., 3,200—550 volt	684

Garlock-Walker Machinery Company, Limited

32 FRONT STREET WEST, TORONTO

IMMEDIATE DELIVERY

DRILLING MACHINES.

Leland H.S. B.B., bench type.
No. 1½ Knight Driller and Miller.
30″ Lodge & Davis, S.H., B.G., P.F.
20″ W. F. & J. Barnes, 4-spindle.
No. 11 P. & W. Multiple, 10 spindles.
3′ W. E. Gang Plain Radial.
4′ Mueller Plain Radial.
Pawling & Harnischfeger Horizontal Driller.

GEAR CUTTERS.

Reynolds Hobber.
No. 11 B. & S. Automatic.
30″ x 9″ G. & E. Auto., for spur and bevel.
24″ x 7″ G. & E., for spur.
No. 3 26″ B. & S., for spur.
36″ Walcott, for spur.

GRINDERS.

Yankee Drill.
No. 184 Wells Cutter and Reamer.
No. 2 Woods Universal Cutter and Tool.
No. 1 Brown & Sharpe Universal.
No. 2 Brown & Sharpe Surface.
14″ x 20″ B. & S., plain.
No. 21 Landis, plain.
Garvin Hole Grinder.
Gisholt Tool Grinder.
No. 1 Gardner Disc.
No. 5 Diamond Water Tool.
No. 6A Diamond Universal Disc.
No. 16 Gardner Disc Grinder.
No. 24 Gardner Disc Grinder.

LATHES.

13″ x 5′ P. & W., C.R. taper.
14″ x 6′ Fairbanks, C.R., taper.
16″ x 6′ Prentice, C.R.
18″ x 8′ L. & S., pat. head, C.R., taper.
18″ x 10′ Fitchburg, C.R.
18″ x 12′ Barker, C.R.
20″ x 14′ Blaisdell, C.R.
21″ x 12′ New Haven, C.R.
24″ x 13′ New Haven, C.R.
31″ x 26′ Bradford.
36″ x 20′ American, T.B.G.
38″ x 16′ Fifield.
36″ x 20′ Houston, Stanwood & Gamble, selective geared head, single pulley drive, taper attachment (new).
36″ x 28′ Houston, Stanwood & Gamble, selective geared head, single pulley drive, taper attachment (new).

PLANERS.

24″ x 24″ x 4′ Gray, one head.
24″ x 24″ x 6′ American.
26″ x 26″ x 8′ Pease, one head.
30″ x 30″ x 8′ Woodward & Powell, one head.
30″ x 30″ x 8′ Cincinnati, two heads.
36″ x 36″ x 14′ Sellers, one head.
40″ x 38″ x 14′ Putnam, one head.
50″ x 50″ x 18′ New Haven, two heads, two extension heads.
72″ x 48″ x 14′ Gray, two heads, one side head.

SCREW MACHINES.

1″ B. & S., plain.
No. 1 Foster, plain A.C. and W.F.
Belt Lacing Machine.
16″ P. & W., plain.
No. 2 Costello, plain head.
No. 2 P. & W., friction head.
No. 4 Pearson, geared head.
No. 3 Bardons & Oliver, plain head.
⅞″ Cleveland, Automatic.

TURRET LATHES.

No. 22 Garvin.
16″ Lodge & Shipley.
25′ Niles.
2″ x 24″ Jones & Lamson.
2″ x 26″ P. & W., power feed to turret slide and cut-off.
3″ x 36″ Jones & Lamson, chucking equipment.
3″ x 36″ Jones & Lamson, bar equipment.
21″ Gisholt, with taper.
2 24″ Gisholt Turret Lathes, taper attachment.

PUNCHES AND SHEARS.

No. 3 American Can.
No. 3 Bauroth, O.B.I.
No. 74½ Bliss, S.S., Geared.
No. 3A Lennox Double-end Punch and Shear.

MISCELLANEOUS.

24″ Bullard Vertical Turret Lathe, 1 swivel head and one side head.
No. 2 Cochrane-Bly Die Filer.
50-lb. Bradley Strap Hammer.
¾″ Acme Forging Machine.
52″ Niles Car Wheel Boring Mill.
6″ x 14″ P. & W. Thread Miller.
No. 1 American Air Tempering Furnace.
Belt Lacing Machine.
3-ton Yale Duplex Hoist.

STOCKER-RUMELY-WACHS COMPANY

117-121 No. JEFFERSON STREET CHICAGO, ILLINOIS

Convinced?

Probably the impartial opinion of a user—not our claim alone—has carried weight with you. Perhaps you're convinced—almost. For the sake of better pulley service throughout your plant, now is the time to give the Bernard a trial.

The Bernard Wood Split Pulley

in material and workmanship, in appearance and finish, is precisely what it looks—a wood split pulley built to serve both best and longest.

But a trial is more convincing than our claims or a user's opinion. For your own sake, we urge a trial; also because repeat orders so frequently follow trial orders.

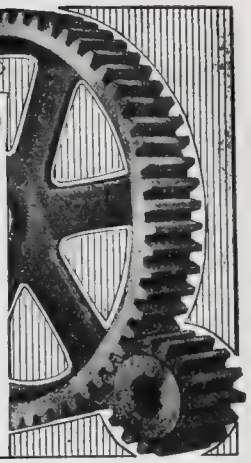
Write for prices and full particulars.

The A. Bernard Industrial Company

Manufacturers of High Grade Power Transmission Appliances.

Office and Works:
FORTIERVILLE, QUE., CAN.

CUT GEARS



Rawhide — Steel — Brass — Cast Iron

Try our W-G Rawhide Silent Gear. Designers and Builders of Special Machinery.

Winnipeg Gear & Engineering Co.
197-199 Princess St., Winnipeg, Man.

WE CAN SELL

Your second-hand machinery.

Let us tell you about the results from condensed ads in

CANADIAN MACHINERY
Classified Advertising Section

Opportunity Knocks Here Every Week!

It may not knock for *you* this week, but read these pages regularly and grasp the opportunity when it presents itself. Every ad here is an opportunity for someone! Your time is coming. If you think the time is ripe to spring that little proposition of yours, send in your copy now for the next issue. If it is of interest to our readers, rest assured it will get attention.

CANADIAN MACHINERY

Classified Advertising Section

143 University Avenue, TORONTO

SPECIAL MACHINERY

Special Machinery, Jigs, Fixtures, Punches and Dies, Small Tools, Screw Machine Products, Gauges, Forgings, Etc.

CONTRACT WORK

Shell Manufacturers

Get our Prices on Gauges, Boring Bars Rough Turn Drivers, Etc., for 6 in. SHELL.

GENERAL MACHINE WORK

Brass and Aluminum Castings

Prompt Delivery

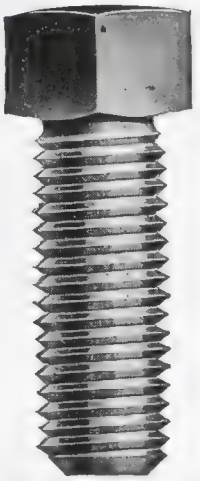
THE

MONARCH BRASS MFG.

COMPANY, LIMITED

71 Browns Ave., - Toronto, Ont.

ACCURACY



Send us your rush orders for Screws and Nuts. We ship from a stock where "Accuracy" is all important.

Prompt service and "G A L T" quality goods only.

Specialists in Gap and Set Screws.

THE

GALT MACHINE SCREW CO., LIMITED

GALT, ONTARIO

Eastern Representatives: The Canadian B. K. Morton Company, Limited, 49 Common St., Montreal, Que.

Homer & Wilson

Stamping & Tool Works

WE MAKE THE TOOLS

AND

PRODUCE THE STAMPINGS

Let us quote on your requirements.

1-3-5 Lancaster Street
Hamilton, Ontario

SPECIAL MACHINERY

QUALITY PRODUCTS AT REASONABLE PRICES

We make special tools for many purposes. Gear Cutting, Gauges, Jigs and Fixtures, special machinery and small tools of every description.

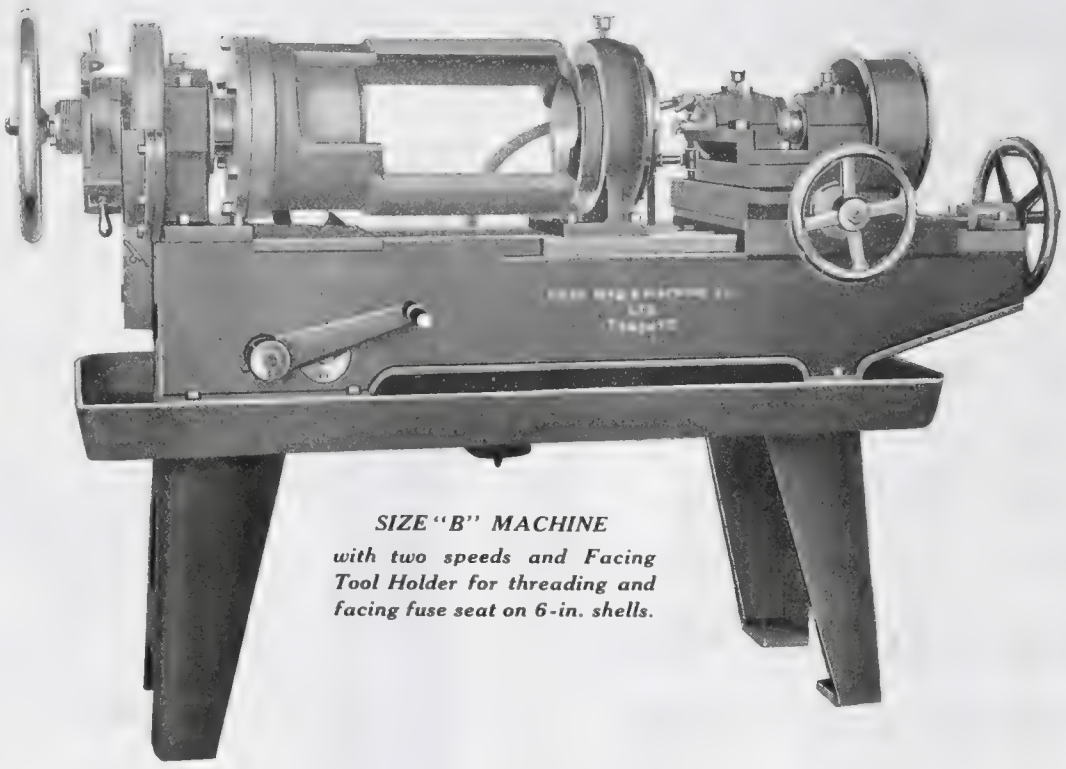
Brown Engineering Corporation
LIMITED, TORONTO

415-419 King St., W. Tel. Adel.425

MADE IN BR·EN·CO CANADA

If any advertisement interests you, tear it out now and place with letters to be answered.

THREAD MILLERS



SIZE "B" MACHINE
with two speeds and Facing Tool Holder for threading and facing fuse seat on 6-in. shells.

Gray's Guarantee

that their THREAD MILLERS will MILL THREADS to SIZE, and TRUE UP FUSE SEAT, thus eliminating hand tapping and hand seating, and also guarantee a stated production.

Size "A" Machine handles Shells from 3-in. to 5-in.
Size "C" Machine handles 8-in. and 9.2 in. Shells and Adapters.

Thread Millers for Fuses and any line of manufacturing work.

PROMPT DELIVERIES

THE GRAY MFG. & MACHINE CO., LIMITED
686-692 St. Clarens Avenue TORONTO, CANADA

CELFOR

HIGH SPEED TWIST DRILLS

CELFOR drills are made by a fundamentally correct principle—twisted (not milled) while hot, thus preserving the natural fibrous grain of the metal. The finest high speed steel goes into them. The nickel steel shank is larger than that used on milled drills. They are provided with maximum chip clearance; cut freely; require less grinding; eliminate tang trouble; consume less power; reduce drill breakage.

Do you wonder why we say "Let your choice be a Celfor."

CLARK EQUIPMENT CO.
Buchanan, Mich.
Canadian Agents: RUDEL-BÉLNAP
Toronto, Montreal

If any advertisement interests you, tear it out now and place with letters to be answered.

Doing it the Winfield Way

at the plant of the Winnipeg Ceiling & Roofing Co., Winnipeg, Manitoba

ANOTHER installation where the Winfield Way proved to be the most efficient and economical method of handling the variety of welding work in this shop. Mr. W. J. McMartin, President and Manager, says: "This machine has done good work for us, and we could not afford to be without it."

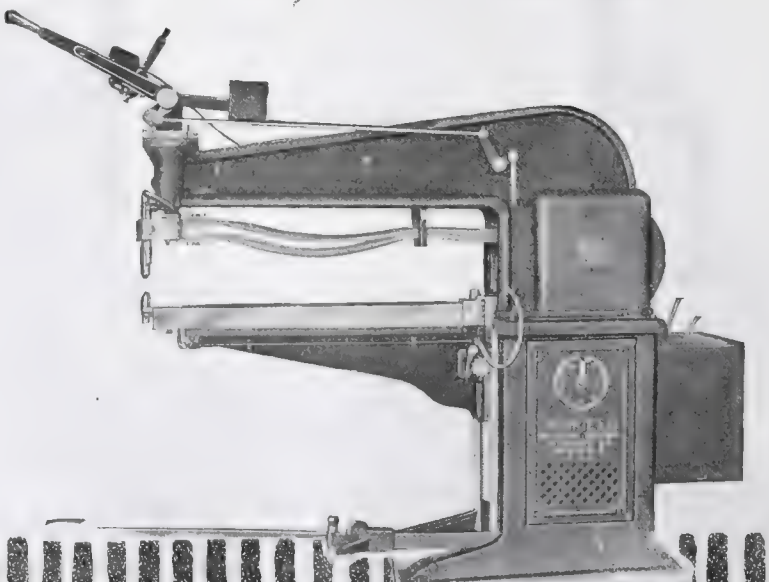
Two boys can turn out more and better work with a Winfield Welder than could eight to ten men by the old punch and rivet method. Does that mean anything to you in these days of mounting labor costs and the scarcity of labor?

The Winfield will help you solve these problems of labor.

Its design and construction are perfect, its operating cost is small, its operation is simple. It is adapted to the welding of any conceivable sort of metal. There is a Winfield for your shop.

OUR service and advisory department will gladly furnish you with samples of welding as applied to your requirements and material, together with full data as to costs and time.

---and the machine that does it

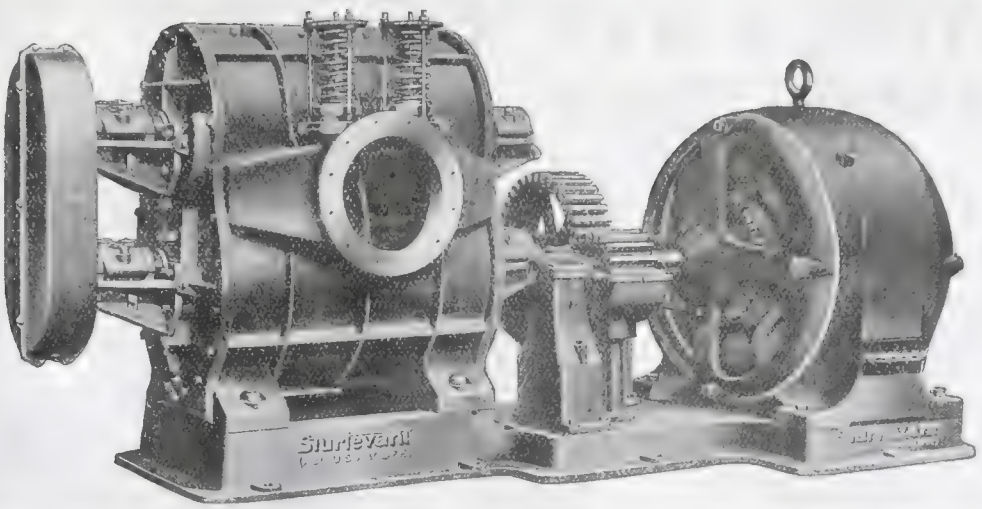


The Winfield Electric Welding Machine Co.

WARREN, OHIO

31 Ottawa Bank Bldg., Montreal, Que.

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

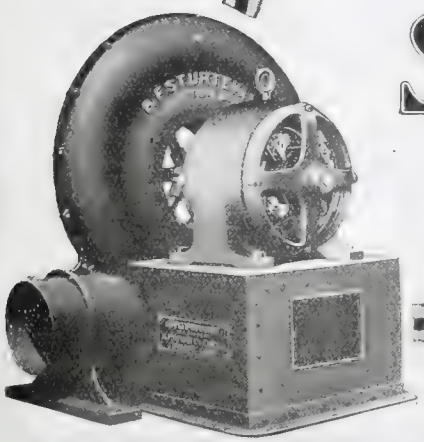


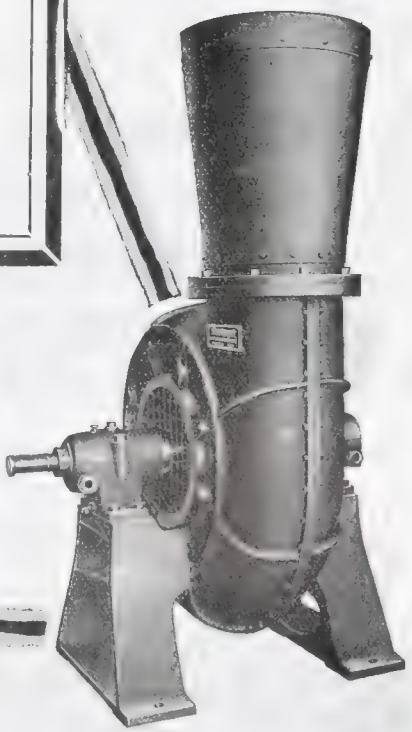
FOUNDRY BLOWERS

What Type Shall I Install?

THE particular blower to meet the conditions in your own foundry can be furnished by Sturtevant. We do not make just one type of blower and recommend it for any or all conditions. On the other hand, we have a complete line which comprises various types of High Pressure Positive Blowers and Centrifugal Steel Pressure Blowers. For this reason we can make recommendations without prejudice.

Why not dictate a letter now to our engineering department, giving details of your conditions.





Sturtevant

(TRADE MARK)

B. F. STURTEVANT COMPANY
of Canada Limited
GALT, ONTARIO
Montreal, Toronto, Winnipeg, Vancouver

If any advertisement interests you, tear it out now and place with letters to be answered.

PROVIDE A MAN WITH GOOD TOOLS

and you will get good results.

In files---give him one or other of the "Famous Five."

They are hard and sharp ---consequently the mechanic does good work with the minimum of labour.

And that's a desirable result for all concerned.

Specify "Famous Five" when ordering.

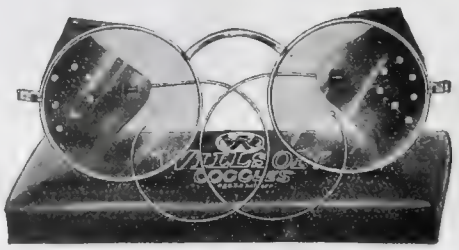
They are:

KEARNEY & FOOT
GREAT WESTERN
AMERICAN
ARCADE
GLOBE

Made in Canada by

WILLSON
SAFETY GOGGLES
REG. U.S. PAT. OFF.

For the comfortable protection



Style A1, Albex Eye Protector

The most successful leather sideguard goggle for grinders, machinists and turning-process operators. Also worn by many British and United States troops. Rustproof, adjustable and can be worn over other glasses. Furnished with detachable elastic headbands or flexible cable earbows. Amber, smoke, fluozal or clear micoquille lenses. Price, including steel cases, $9.00 per doz., $1.25 per pair.

T. A. Willson & Co., Inc., 23 Scott St., Toronto
Factory and Main Offices, Reading, Pa., U.S.A.
Chicago Mallers Bldg. **San Francisco** Head Bldg. **London** 9 Hatton Garden

A Giant for Work

An Infant for Oil

That describes the Bond as well as anything we know. Constructed of the finest materials, it will outlast any hanger on the market.

Made with the famous ring oiling system, the Bond gets positive lubrication without wasting a drop of oil.

Try a Bond—that's all we ask. The result—repeat orders—are reassured.

Get that Bond Book to-day.

CANADIAN BOND HANGER & COUPLING CO.
Limited
ALEXANDRIA **ONTARIO**

GOOD LIGHTING

Adds To Quality and Increases Production

Decreasing hours of daylight are giving greater importance to the problem of efficient, artificial shop lighting.

Factories, mills and shops are working under forced pressure, but shorter hours of bright sunlight increase the hazard of error, and tend to decrease accurate production.

Keep your factory bright and cheerful. As the darkness of the late afternoon approaches, flood every corner with the brightest, soft, clear, white light which is conducive to continuous, accurate work.

Large quantities of material and many hours of labor are lost through careless, haphazard, inaccurate tooling and finishing during the late afternoon hours and throughout the night shift because of partially lighted factories.

LACO NITRO LAMP "THE LIGHT THAT GIVES MORE LIGHT"

puts the equivalent of soft, bright sunlight in your factory, mill or shop. It gives you twenty-four hours of bright, clear, soft, white light. It relieves eyestrain, increases accuracy, eliminates losses due to inadequate lighting, reduces accident and error hazard and makes your shop cheerful, bright and agreeable for your men.

This wonderful new Laco Nitro Lamp reduces the current consumption. It is the latest development of the tungsten electric bulb. The tungsten filament in the Laco Nitro Lamp is suspended in a nitrogen gas-filled bulb—giving a clearer, whiter and greater light for a given amount of power than any other type lamp.

Inquire from your nearest dealer.

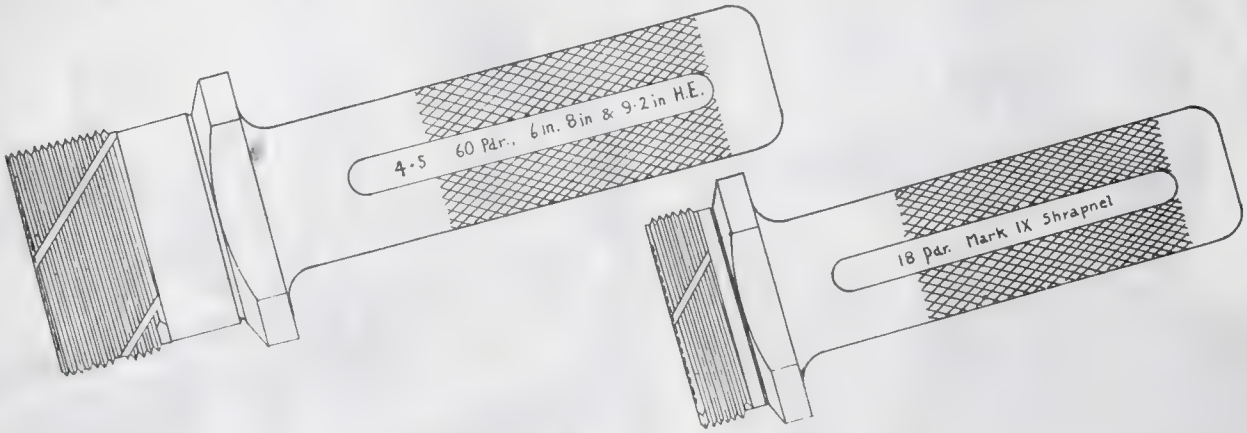
CANADIAN LACO-PHILIPS COMPANY, Limited

Stocks available at

Montreal **Toronto** **Winnipeg** **Vancouver**

If any advertisement interests you, tear it out now and place with letters to be answered.

FUSE HOLE GAUGES

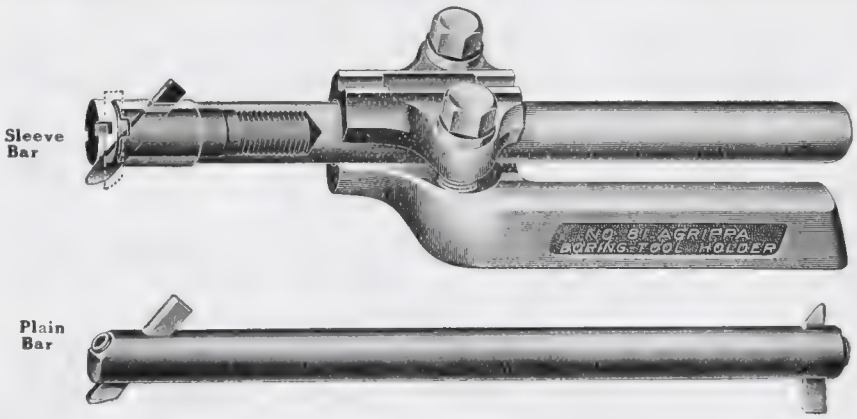


Manufacturing and inspection fuse hole gauges for all size shells. A surplus stock enables us to ship immediately.

Windsor Machine & Tool Works

Windsor, Ontario

Williams' "AGRIPPA" Multiple Bar Boring-Tool Holder Stops Waste



ALL "AGRIPPA" TOOL HOLDERS CAN BE SHIPPED PROMPTLY

ITS sleeve bar cap admits a straight or angular cutter; and you can quickly insert either at the business end of the bar without removing the cap or disturbing the setting of either the bar or the holder.

You need neither make nor buy any bushings hereafter, for the "twin screw" fastenings of "AGRIPPAS" within their range accommodate any bar section you may have handy.

Now's the time to begin saving—caps, bushings and time!

Procure your tool holder text book here or from your dealer and learn the many other economies afforded by

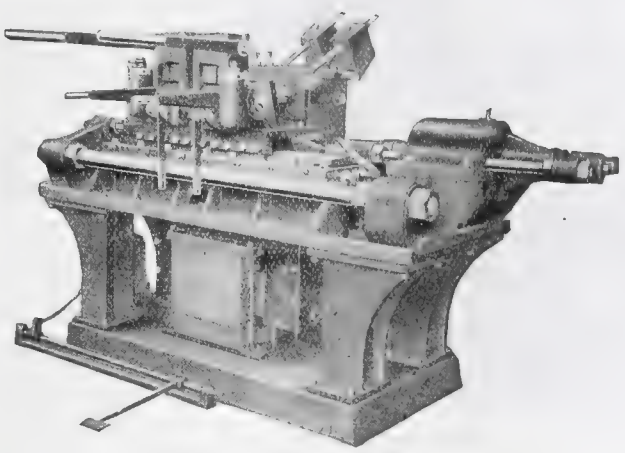
Williams' Grand Prize "AGRIPPA" Tool Holders

"THE HOLDERS THAT HOLD"

Western Office and Warehouse
40 S. Clinton Street
Chicago, Ill.

Quality alone is our measure of "AGRIPPA" Tool Holder Value

Thomson Process
Electric Welding



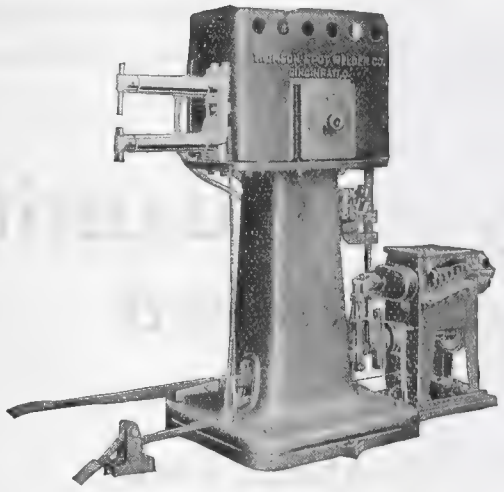
40-A-9
Butt Welding Machine

Waste!

The Thomson System of Electric Welding eliminates waste. Big manufacturers who allow so much for spoiled work each day will find it far cheaper to buy a Thomson Butt Welder. The saving in six months will more than pay for the initial cost.

For welding automobile rims, brake rods, angle irons, pipe joints or whatever your problem might be there is a style of Thomson Butt Welder that will do it more economically than you are getting it done now.

Send for Bulletin B-4.



Combination Foot Operated and Six Speed Gear Box. Belt Driven.
Type 177.

The Thomson Spot Welder makes more and better work possible

One firm writes, "One boy and a 'Thomson' can do more and better work than five men were able to do by the method we formerly used."

The Thomson Spot Welder is simple to operate. Just place the two pieces of metal to be welded between the copper die points—press the foot treadle and the pieces are united forever. No smoke, danger or dirt. No holes to punch. No rivets used.

There is a Thomson Spot Welder for your work. Let us have your requirements and we'll show you the machine.

Send for Bulletin S-4.

Thomson Electric Welding Co. Thomson Spot Welder Company
Lynn, Mass.

Canadian Sales Offices, 311 Falls Street, Niagara Falls, N.Y.

Thomson Process
Electric Welding

Economy, Reliability and Durability

The Inevitable Results of Oxy-Acetylene Welding

Whatever the nature of your industry or whenever the necessity arises for joining two pieces of metal for any purpose whatsoever, Oxy-Acetylene Welding is almost invariably the most efficient, convenient and economical method to employ.

For coping with machinery break-downs and avoiding losses in production, obviating enormous costs of replacements and other incidental losses, it saves its cost many times over.

Steam Dryer entirely constructed by Oxy-Acetylene Process.

With a complete Oxy-Acetylene Welding and Cutting Plant, Iron and Steel can be quickly cut to shape and welded together, producing an article of unequalled strength and durability, perfectly leak-proof and of a neat appearance. After smoothing the parts it is impossible to detect the joint.

By this method, not only is the manufacturing cost of the article reduced, but its market value is greatly enhanced.

"Efficiency" of ten years ago is not Efficiency to-day.
Other Industries **similar** to yours are benefitted by the Oxy-Acetylene Process. **Why not yours?**
Investigation incurs no obligation. Write to-day for particulars.

L'Air Liquide Society, **Canadian Factories: Toronto, Montreal, Winnipeg, Halifax (Under construction)**

Quality Quantity
Guaranteed

Write US About Your Acetylene Supply

Commercial Acetylene Welding Co., Inc.

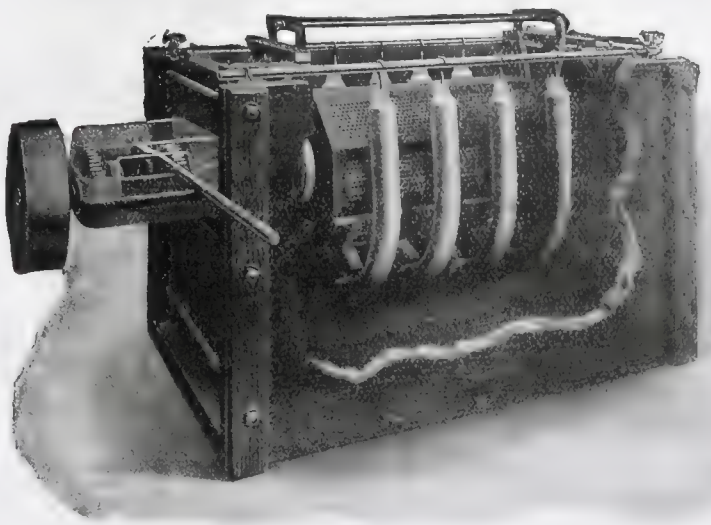
103 Bay Street, Toronto

ATLANTA, GA.
AURORA, ILL.
BOSTON, MASS.
BOUND BROOK, N.J.
EAST DEERFIELD, MASS.

TORONTO, ONT.
SAN FRANCISCO, CALIF.
MOBERLY, MO.
W. BERKELEY, CALIF.

Main Office
80 Broadway, New York

Mechanical Electro-Plating Apparatus



The C. H. & V. W. Mechanical Electro-Plating Apparatus Type B. Gear Drive.

Modern in every detail, particularly adapted for electro-plating quantities of small work in bulk. Saves time labor and material. Write for Bulletin No. 113.

Oblique Plating Barrel Apparatus

These machines are made in four sizes; they are smaller and less expensive than the Type B. A wonderful aid in plating screws and other small articles. Write for Bulletin No. 116.

We manufacture everything for *Polishing and Plating of Metals.*

CONSULT US AND REDUCE YOUR COSTS

CANADIAN HANSON & VAN WINKLE COMPANY, LIMITED

TORONTO - - CANADA

To Shipbuilders and Steel Corporations

THE Radiagraph is one of the exclusive developments by the Davis Bournonville Company for mechanical cutting of steel plate, with the oxy-acetylene or oxy-hydrogen flame. With the radiagraph, steel plate and armor plate from 1 to 18 inches thick is smoothly cut at speed varying from 4 to 18 lineal inches a minute, according to thickness of steel. With the Oxygraph, another exclusive development, steel plate from 1 to 18 inches thick is readily cut in any direction, according to pattern or tracing, following straight or irregular lines, curves or sharp angles with equal facility. Extensively used by

Bethlehem Steel Company,
Youngstown Sheet & Tube Company,
Carnegie Steel Company,
Lukens Iron & Steel Company,
New York Shipbuilding & Dry Dock Company,
General Electric Company,
Westinghouse Electric,
Canadian Westinghouse,
American Locomotive,
Canadian Locomotive,
Lima Locomotive Company,
Marion Steam Shovel,
Camden Forge Company,
Pennsylvania Shipbuilding,
United States Navy Yards at Boston, Brooklyn, Philadelphia, Norfolk, Washington, San Francisco and Seattle.

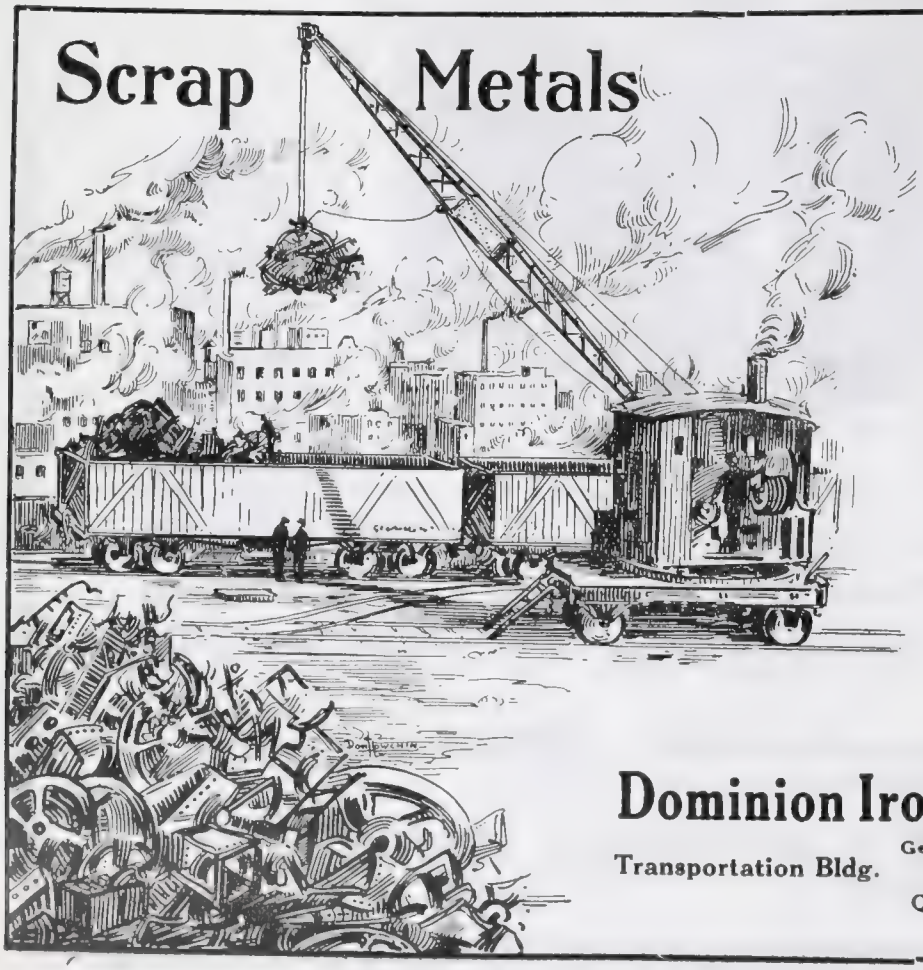
We are demonstrating the Radiagraph and Oxygraph throughout Canada, and if you are interested we would be glad to forward catalogue and price lists. "Davis Apparatus" leads the World for Range, Efficiency and number of Users.

Carter Welding Co. of Toronto, Limited

Canadian Agents for Davis-Bournonville

9 SHEPPARD STREET - - TORONTO, ONT.

Scrap Metals



Scrap Iron, Steel and Metals

No undertaking is too large for us. We are Scrap Metal Specialists, and can co-operate with you in the dismantling of railway equipment, bridges, plants, steamers, mills and will take your rails and machinery.

Shell Makers. We can take care of all your scrap materials, at highest prices.

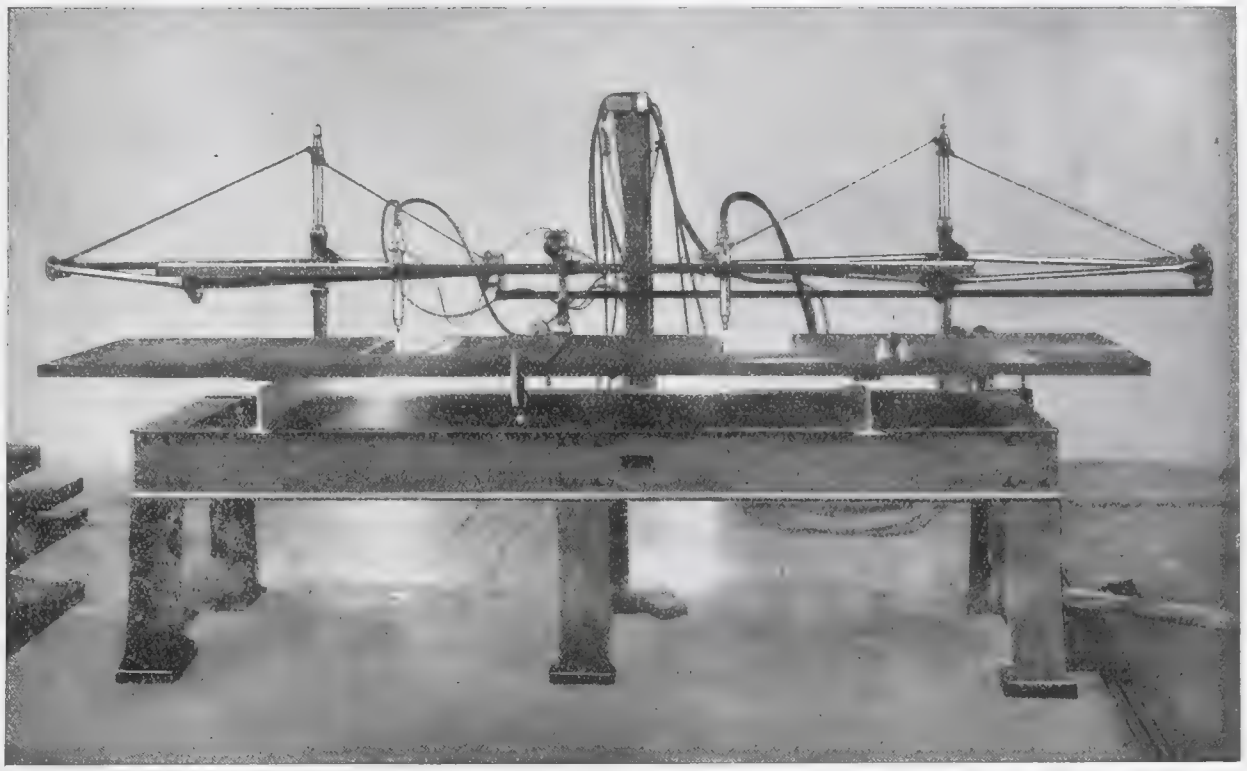
Give us particulars and we will relieve you of all worry.

Dominion Iron & Wrecking Co. LIMITED

Transportation Bldg. General Offices: - **Montreal, Quebec**

Quebec, Que.

CUTTING STEEL PLATES With Oxy-Acetylene or Oxy-Hydrogen Torches



No. 2 OXYGRAPH

Cutting Plates ¼ to 20 inch thick. Speed 4 to 15 inch per minute.

This was one of the striking exhibits at the recent American Foundrymen's Convention in Boston

The Oxygraphs, Nos. 1 and 2, and the Radiagraph, are exclusive Davis-Bournonville developments for mechanically cutting steel plate, ingots, billets, and risers, with the oxy-acetylene and oxy-hydrogen flame. With the Oxygraph, steel plate up to 20-in. thick is cut in any direction, following pattern or tracing, along straight or angular lines, curves or sharp angles, with equal facility, at speeds varying from 4 to 15-in. or more per minute according to thickness. The No. 2 Oxygraph is a heavy-duty machine, and with two torches, duplicate cuts are made, as in the illustration showing side frame being cut out for journal boxes. Frame of the machine moves back to permit service by shop crane.

Oxygraphs and Radiagraphs are extensively used by American Locomotive Co., Canadian Locomotive Co., Lima Locomotive Co., J. G. Brill Co., Lukens Iron & Steel Co., Bethlehem Steel Co., Carnegie Steel Co., Crucible Steel Co., Youngstown Sheet & Tube Co., Camden Forge Co., E. W. Bliss Co., Marion Steam Shovel Co., American Brass Co., United Shoe Machinery Co., General Electric Co., Westinghouse Electric & Mfg. Co., Canadian Westinghouse Co., New York Shipbuilding Corp., Newport News Shipbuilding & Dry Dock Co., Pennsylvania Shipbuilding Co., and in numerous other metal working plants, including United States Navy Yards at Boston, Brooklyn, Philadelphia, Norfolk, Charleston, Washington, San Francisco and Seattle.

Broad basic patents Nos. 1,059,329 and 1,118,183 cover cutting torches and mechanical means for supporting and propelling same at uniform and determined speed.

Manufactured and sold only by the Davis-Bournonville Company, which has developed the widest range of equipment made for utilizing the oxy-acetylene and oxy-hydrogen processes of welding and cutting, and **"Davis' Apparatus" leads the world for range, efficiency, and number of successful users.**

DAVIS-BOURNONVILLE COMPANY

General Offices and Factory, JERSEY CITY, N.J.

CARTER WELDING COMPANY, *GENERAL DEALERS* TORONTO

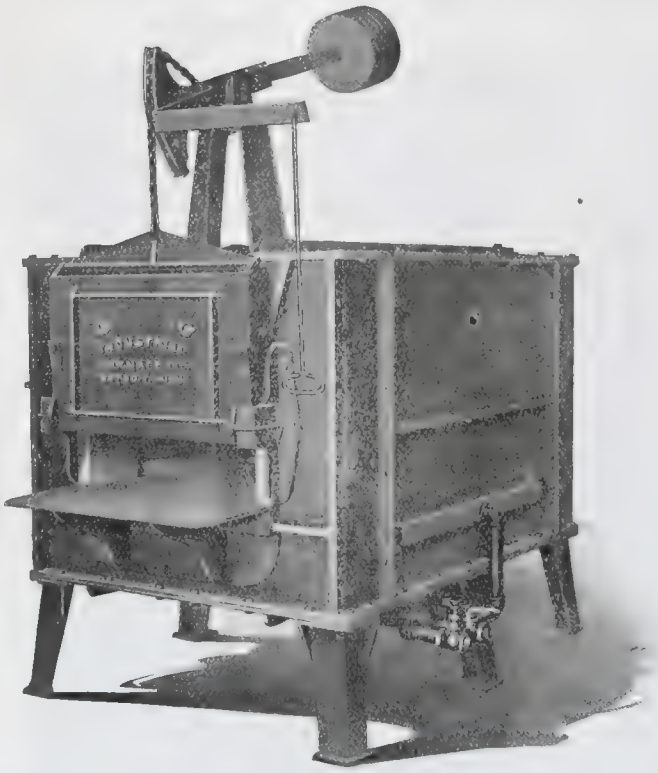
Canadian Factory, NIAGARA FALLS, ONTARIO

New York | Boston | Chicago | Detroit
Philadelphia | Pittsburgh | St. Louis | Seattle
Cleveland | Cincinnati | San Francisco | Toronto

OXY-ACETYLENE WELDING DAVIS APPARATUS DAVIS-BOURNONVILLE CO. N.Y.

If any advertisement interests you, tear it out now and place with letters to be answered.

BELLEVUE FURNACES



For Heating, Case Hardening and Annealing

Under present conditions in Canada, fuel economy is an important factor. The use of a Bellevue Furnace will save in fuel consumption, and assure the highest possible class of work.

The type illustrated is our semi-muffle design. The combustion is perfect and precludes the formation of any oxidizing elements. The flame is not visible in the muffle, and does not come in contact with the material. Scaling is reduced to a minimum, and cannot fall into the combustion chamber.

The furnace heats up rapidly and will retain heat for a long period after burners have been shut off, with resulting economy in fuel consumption.

We have furnaces of every type for every purpose. The Bellevue Line is designed particularly to save labor and fuel. Let us send full particulars. Write for illustrated catalogue.

Bellevue Industrial Furnace Co.

Julius Hinz, President

703 Bellevue Avenue **Detroit, Mich.**

Representative in Canada:
H. W. Petrie, Limited, Toronto, Canada

BRASS Castings

The coupling of expert work with unexcelled equipment enables us to produce on a large scale Brass Castings of any size or alloy.

Our prices, too, are most reasonable; for our large purchases direct from the smelters command their every price favor.

For better Brass Castings at a money saving, send your orders to us. We promise that our work will please you.

The St. Lawrence Welding Company, Ltd., Montreal, P.Q.

Manufacturers of Steel Tanks, Air Receivers, Welded Tanks, Etc. Electric Welders, Oxy-Acetylene Welders. Boiler Repairs. Lead Burning and Brass Foundry Work.

Office: 138 Inspector Street **Works: 59 Olier Street** **Telephone: Office, Main 5779, Manager's Res., Westmount 3483**

The Oven Equipment & Manufacturing Company

NEW HAVEN, CONN.

"CRAWFORD SECTIONAL" OVENS

Heated with our Enclosed Flame Gas Burners, or Electricity

FOR BAKING JAPANS AND OTHER FINISHES ON METAL.

Ovens carried in stock and built to meet requirements of manufacturers.

Builders of All-Steel Oven Trucks with Roller Bearings.

Canadian Representatives: The A. R. WILLIAMS MACHINERY COMPANY, Ltd.

ST. JOHN, N.B. TORONTO WINNIPEG VANCOUVER

Large output on very low fuel consumption

This is assured you when you install Tate-Jones Side Fired (Single or Double Chamber) Annealing Furnaces. Large output, of course, is the aim of every manufacturer. The bigger the output and the smaller the amount of fuel used, the greater the profits. Then, too, there must be a uniformity of finished product.

Accurate control and a uniform distribution of heat are also highly essential. All these you will secure with

TATE-JONES

Side Fired Annealing Furnaces

as illustrated below.

In the double furnaces, the heating chambers are separated by a solid fire brick wall, making it possible to heat each chamber independently of the others. The arrangement of the combustion chamber and flues permits you to get the maximum heating value from the fuel.
These furnaces are designed to take care of all classes of heat treating. They give an even heat all over the chamber without any danger of oxidation. These furnaces require no stack and burn either oil or gas.

Full information concerning these, as well as any other Tate-Jones Furnaces, sent upon request. State your particular needs, or give some idea of the products handled. Ask for Catalog of Heat Treating Furnaces.

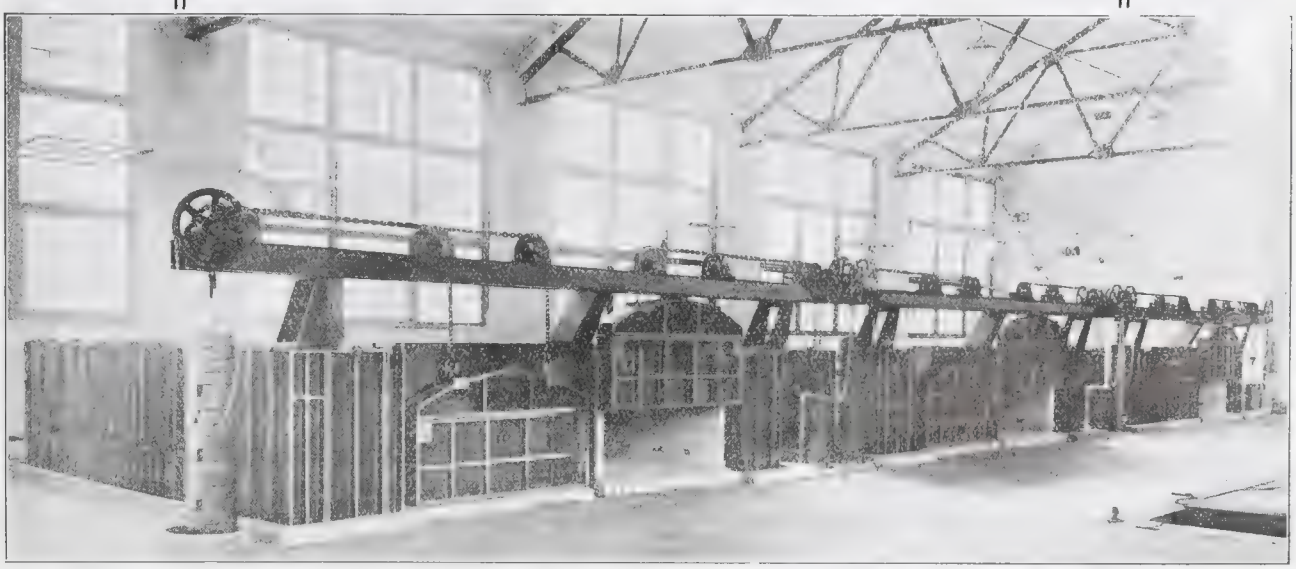
TATE-JONES & CO., Inc., Pittsburgh, Pa.

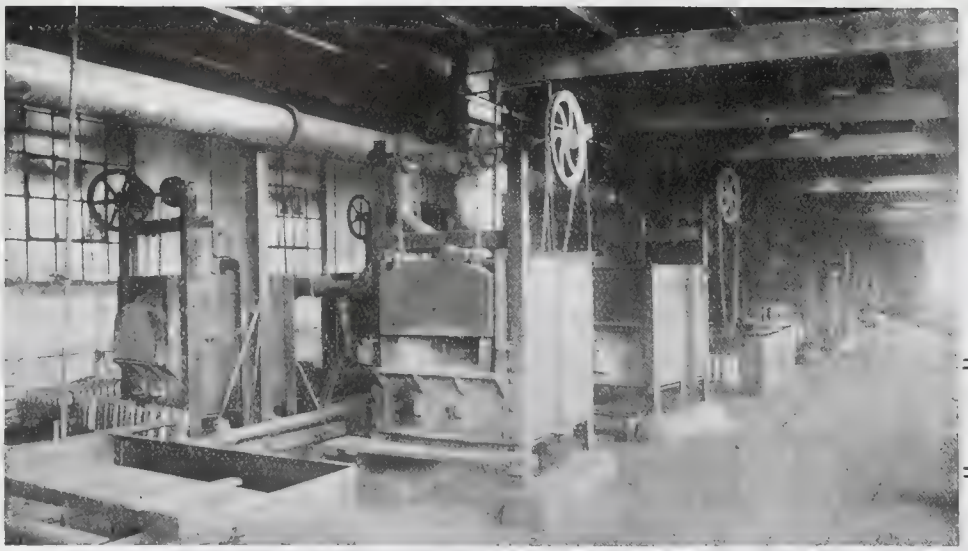
FURNACE ENGINEERS

TATE-JONES ***Double Chamber Side Fired Furnaces***

Installed at

LINDERMAN STEEL AND MACHINERY CO., Muskegon, Mich.



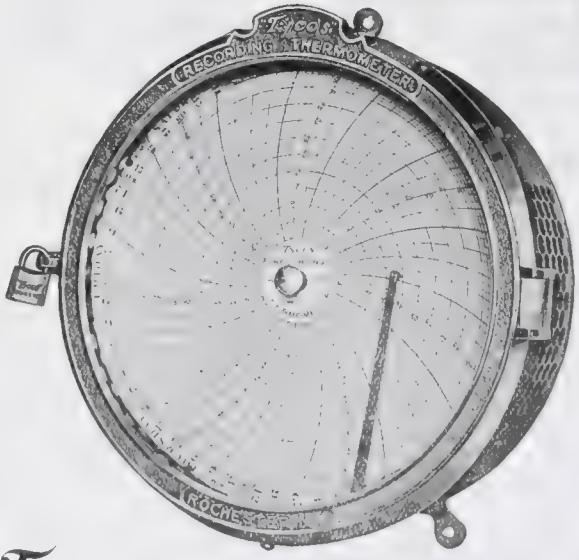


Annealing and Tempering Furnaces installed in the plant of the Canadian Vickers, Limited, Montreal.

"Mecol"

The installation of "Mecol" furnaces shown here is but one instance where a quality furnace was chosen to give maximum production. The furnace you may require is the one we desire to give you complete and full information about. Write us.

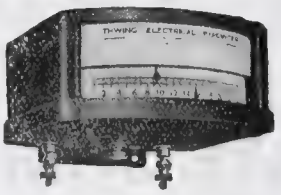
Mechanical Engineering Co.
Limited
THREE RIVERS QUE. CANADA



Tycos Recording Thermometer
Self-contained

Rugged, Sensitive, Accurate. An ideal instrument for recording atmospheric temperatures.

Taylor Instrument Companies
Rochester, N.Y.
201 Royal Bank Building, Toronto, Canada
There's a *Tycos* or *Taylor* Thermometer for Every Purpose



Insuring Accurate Temperature Measurements

THWING
HIGH RESISTANCE MULTIPLE RECORD
PYROMETERS

are instruments of exact precision. Yet they have the rugged durability to withstand hard usage in the toolroom, the steel mill, and similar places.

Thwing Instruments are furnished in either the Indicating or Recording style, giving as many as twelve readings on a single recorder.

Our New Catalog No. 8 covers the entire line. Send for copy.

Canadian Representative:
Mr. James DeVon, 227 Davenport Road, Toronto

Thwing Instrument Co.
34th Street and Lancaster Ave.,
PHILADELPHIA, PA.

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

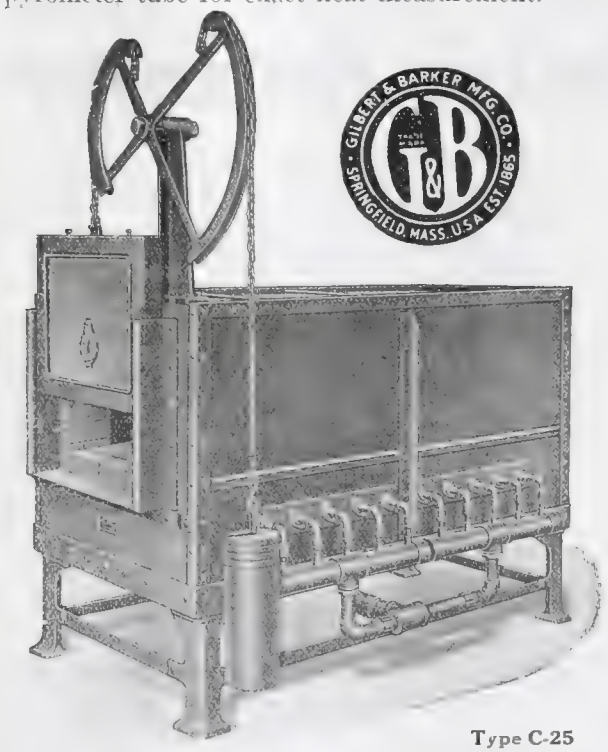
The Furnace Determines the Result

IF you are not getting the results you expected from your heat-treating department, don't blame the men; more than likely the furnaces are the cause of it.

To successfully temper, harden, anneal or case-harden metal, your furnaces must be capable of heating to the proper temperature and staying at that temperature.

Gilbert & Barker Furnaces have been the standard for over fifty years. They are being used in the biggest plants and are giving perfect satisfaction.

They are built right—from the ground up. The built-up construction with heavy sheet metal is reinforced with heavy angle iron straps riveted and bolted. The counter-balanced door clears the opening to full height, admitting the heaviest charge. Fire brick chamber lining, door lining and floor tile are of best quality. An opening is provided for pyrometer tube for exact heat measurement.



Type C-25

Type C-15

THE types shown are only two of over one hundred types and sizes—a furnace for every purpose, made the way they should be made. Our fifty years of practical experience, combined with a thorough knowledge of heat-treating methods used in modern plants, enable us to advise you and furnish you heat-treating furnaces that will do your work right at the lowest cost. This experience is at your service free. Put your problems up to us.

Gilbert & Barker Mfg. Company

WEST SPRINGFIELD, MASS.

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JUST now we are making immediate delivery from stock on many sizes. Stock list No. 24 gives the entire list and more details. Send for it now.

If any advertisement interests you, tear it out now and place with letters to be answered.

Reaming vs Hand Scraping

Acquainting you with the Martell Adjustable Reamer

—an accurately adjustable reamer and adjustable bushings for aligning and finishing crank case bearings of internal combustion engines or any series of bearings which should be *in perfect alignment.*

By its use, all bearings in the same line are reamed and finished simultaneously—an adjustable centering mechanism providing the means for securing the correct alignment of cutting tools.

The design and alignment of the reamer blades absolutely eliminate the possibility of "chatter" or "waves" and insures perfectly finished bearings which are superior to a scraped surface.

By means of a micrometer adjustment, the diameter of the reamer blades may be increased or decreased at will with definite precision. It is also possible to caliper the blades in position for checking the size.

This method of line reaming will produce a better job than can possibly be obtained by hand scraping and a saving of from 50% to 80% in the time required has been effected in many cases.

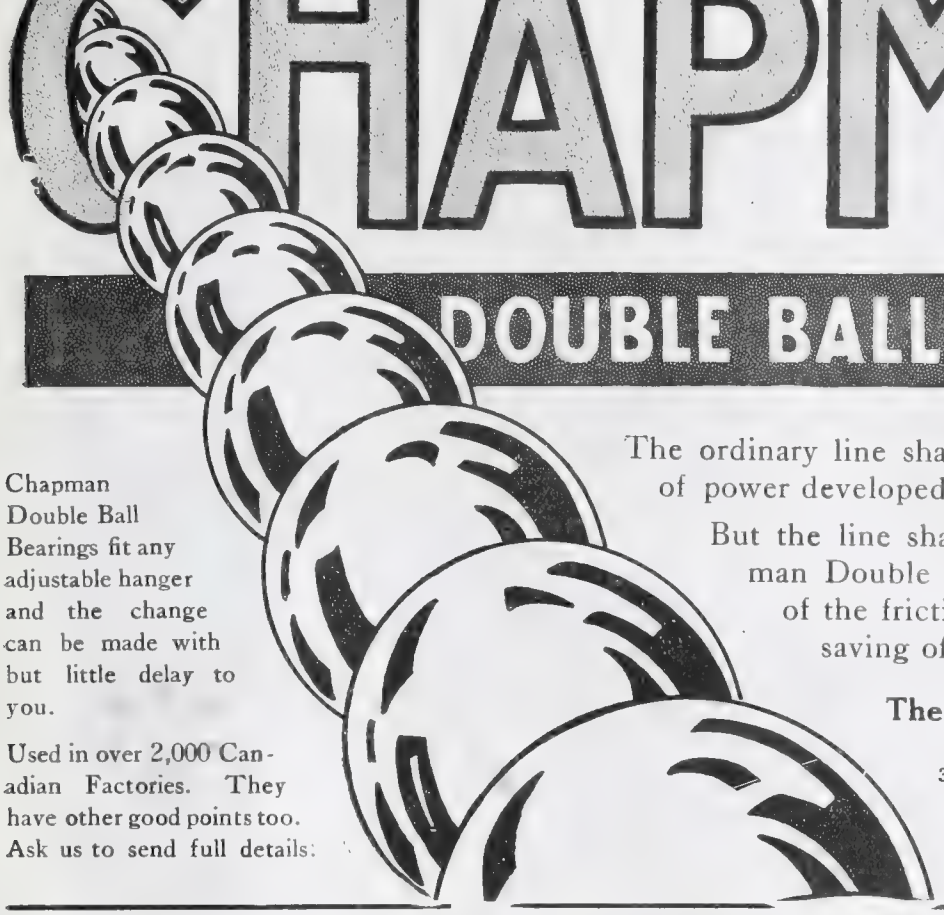
Let us make a proposition covering your particular requirements.

TAFT-PEIRCE

Woonsocket, R.I., U.S.A.

CHAPMAN

DOUBLE BALL BEARINGS



Chapman Double Ball Bearings fit any adjustable hanger and the change can be made with but little delay to you.

Used in over 2,000 Canadian Factories. They have other good points too. Ask us to send full details.

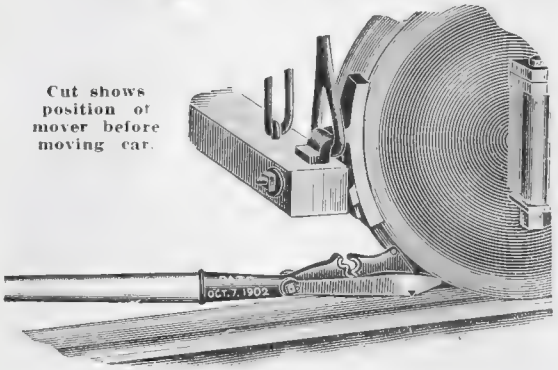
The ordinary line shafting consumes from 15 to 60 % of power developed—

But the line shafting that's equipped with Chapman Double Ball Bearing will save 75 per cent of the friction loads making an average total saving of power from 15 to 30 per cent.

The Chapman Double Ball Bearing Company of Canada, Ltd.
339-351 Sorauren Ave., TORONTO, Canada

TRANSMISSION BALL BEARING CO., Inc.
1050 Military Rd., Buffalo, N. Y.

THE "SAMSON" RAILWAY CAR MOVER



Cut shows position of mover before moving car.

Every railway siding should be supplied with one of these tools. Takes the place of fifteen men and puts the heaviest loaded car just where you want it. It will pay for itself in 30 days.

It is one of the most simple and powerful devices for moving cars by hand.

It is provided with Never-Slip Spurs, which is the most important feature on a Car Mover.

Special attention given to export orders.

Dillon Manufacturing Company
Oshawa, Ontario

Eastern Sales Agent
Alexander Gibb
3 St. Nicholas St., Montreal, Que.

Western Sales Agent
D. Philip
138 Portage Ave., Winnipeg, Man.

Did you ever notice somebody starting a conversation in a low voice with the two words "They say"? The moment you hear it you know it is gossip, scandal, and most likely a lie. But when you hear everyone saying that HARRIS HEAVY PRESSURE is the best BABBITT METAL they can use for all general machinery bearings, isn't it about time to believe them?

Send to our nearest factory for a trial box.

Manufactured and guaranteed by

The Canada Metal Company, Limited
Hamilton Montreal TORONTO Winnipeg Vancouver

Every Manufacturer Who Uses Pulleys Should Read This

LAMB MACHINE COMPANY
Incorporated
IDEAL TRADE MARK
ENGINEERS,
Manufacturers of and Dealers in
MACHINERY.

HOQUIAM, WASH. October 13, 1916.

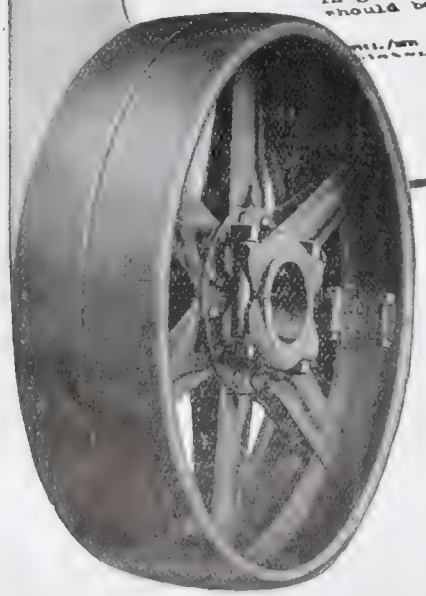
American Pulley Company,
42 Wissahickon Avenue,
Philadelphia, Pa.

Gentlemen:

In reference to our experience with the American Steel Split Pulley, the principal industry using pulleys in this section is saw mills and other lumber manufacturing industries. It has been a recognized fact that saw mill use is one of the hardest tests to which a pulley can be placed. Till within the past few years practically all of the pulleys in use were heavy cast iron pulleys. Some of the mills were using solid built up wood pulleys. When we began to stock American Pulleys two or three years ago, we experienced a great deal of difficulty in convincing lumber manufacturers that the lighter construction of steel would withstand the heavy duty. At first we were able to supply them for the lighter work and gradually have been able to induce manufacturers to install them in other and more severe locations.

We have adopted a policy of absolutely guaranteeing every pulley which we put into service, and are pleased to report that the failures due to inherent weakness of the pulley have been nil. In lumber manufacturing the service is to a very large extent intermittent and our experience with motor drives has shown us that the horsepower consumed on certain machines at certain times is many times the normal horsepower load. It is such service as this that sometimes wreck any type of pulley. We refer, however, to one pulley in particular with a 12" face-driving a heavy planer-which replaced a cast iron pulley and which we were compelled to guarantee for one year. The pulley has stood up to the work perfectly and shows no sign of failure. The American is so entirely satisfactory that we feel absolutely safe in guaranteeing their performance in any position in which a pulley should be placed.

Yours very truly,
LAMB MACHINE COMPANY
President.



AMERICAN STEEL SPLIT PULLEYS

The above letter is eloquent testimony of the great strength and durability of "American" Steel Split Pulleys.

They are guaranteed to perform double belt duty under all conditions not demanding a special pulley. They transmit maximum power with minimum belt slip. They will stand up under greater strains than other pulleys having much more weight.

They reduce pulley power losses to a minimum and are the most efficient and economical pulleys you can buy.

The American Pulley Company, Philadelphia, Pa.

Canadian Distributors:

Williams & Wilson, Ltd., Montreal, Quebec; A. R. Williams Machinery Company, St. John, N.B.; A. R. Williams Machinery Company, Toronto, Ontario; A. R. Williams Machinery Company, Vancouver, B.C.; A. R. Williams Machinery Company, Winnipeg, Manitoba; H. W. Petrie, Ltd., Toronto, Ontario.

Why pay 50% more than is necessary for unloading your Pig Iron when you can save that percentage by using MATHEWS GRAVITY PIG IRON CONVEYOR? Write for our Bulletin C.

CANADIAN MATHEWS GRAVITY CARRIER CO., Ltd.
484 RICHMOND STREET W., TORONTO

STEEL TUBING

Steel Tubing, Butted and Welded for Bedsteads, Agricultural Implements, Trolley Arms, Fence Posts, Etc.

14 to 20 gauge.

Sizes 3/8" to 2" outside diameter.

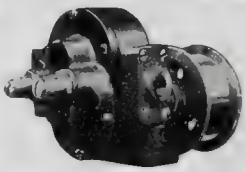
Let us send you samples.

We are equipped with facilities for turning out big orders with the utmost dispatch. Prompt deliveries is one of our specialties.

Standard Tube & Fence Co.

Woodstock, Ontario

What Pumping Capacity Do You Require ?

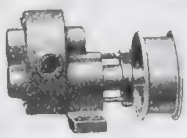


Does the cutting tool on your metal working machine require a stream of 1½ or 16 gallons per minute?

Trahern Rotary Geared Pumps

are so diversified in construction that you can obtain just the size and style suited to the peculiar conditions prevailing at YOUR plant. They will operate at a speed of from 300 to 500 R.P.M. and deliver a stream of from 1½ to 16 gallons per minute. Our special TRAHERN relief valve permits shutting off at discharge without stopping machine.

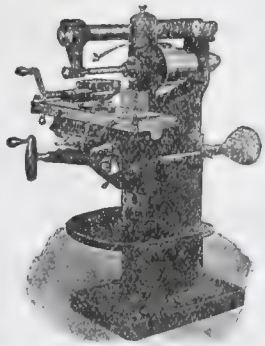
The drive shaft is of high grade, cold rolled steel. The pumps are constructed to prevent excessive wear at stuffing box, a distinctive point of superiority over the centrifugal type. *Write for particulars and list of leading machine tool manufacturers using our pumps.*



Trahern Pump Company

Rockford, Illinois

Canadian Agents: A. R. Williams Machinery Co., Toronto



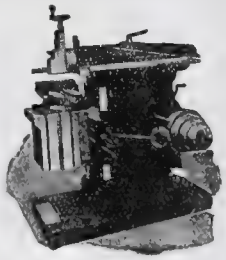
Don't Crowd Your Large Machines

You cannot manufacture small parts economically on a large machine. Steptoe Small Power Feed Millers and Hand Millers are especially adapted for that kind of work, a stiff, heavy tool that can be quickly handled and crowded to the limit. That is the machine to buy for small parts.

If your Planers are crowded take the small jobs and put them on a Steptoe Shaper and you will do them quicker and you will have less money invested in equipment.

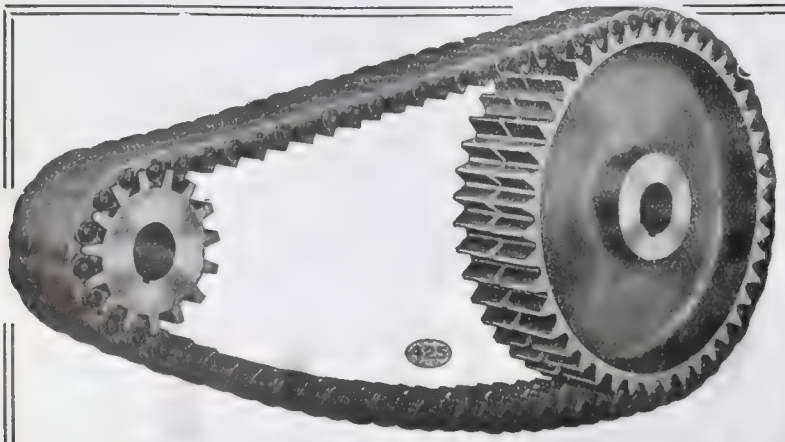
STEPTOE SHAPERS "Just a Little Better."

CIRCULAR ON REQUEST.



John Steptoe Co., Cumminsville, Cincinnati, Ohio, U.S.A.

Canadian Representatives: Garlock-Walker Machinery Co., Toronto, Ont.



RENOLD CHAINS

The proven efficient form of Power Transmission.

PATENT SILENT

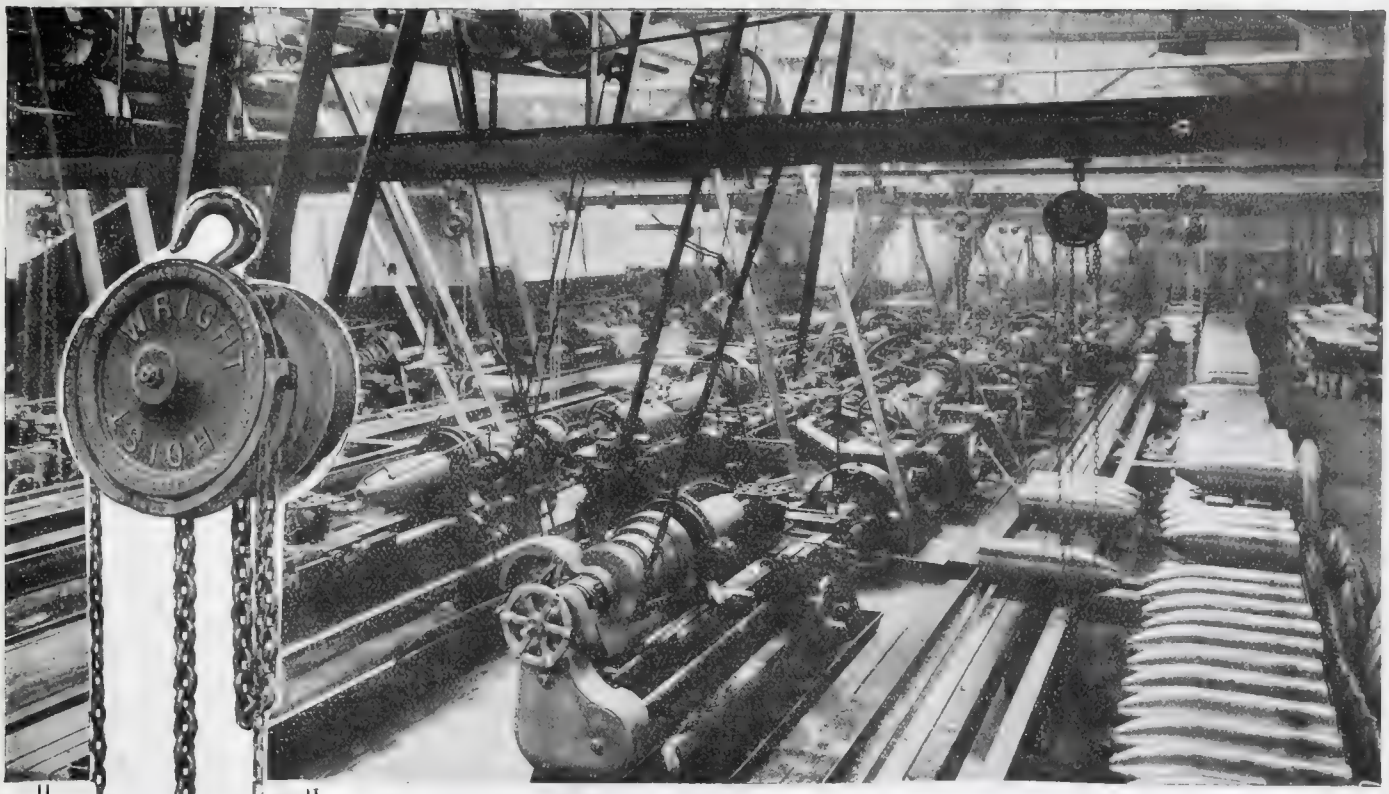
Equally suitable for main shaft or machine drives. Save space and power, increase output and ensure durability.

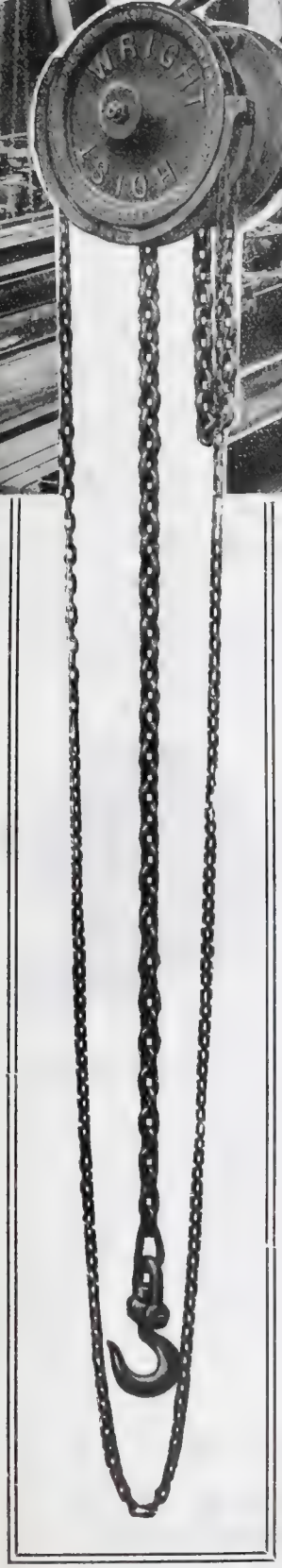
Chain and Parts Carried in Stock.

Sole Canadian Agents

Jones & Glassco. (Reg'd)

Branch Office: TORONTO, ONT. **ENGINEERS** **St. Nicholas Bldg. MONTREAL, P.Q.**





Will They Fit Your Organization?

SHOWING how simple 70 Wright High-Speed Steel Hoists entered into the organization of a Canadian Firm.

The steel construction of this hoist, featured by the non-fouling chain guide, has established the Wright hoist firmly in the minds of Works Managers that they are decided assets in the economy plan of the organization. Regarding your shop organization—is it complete? Could it be made more complete and more economical by the addition of this hoist? Think it over and then inquire of us.

Wright Manufacturing Company

Lisbon Ohio U.S.A.

Canadian Distributors: The A. R. Williams Machinery Co.
Toronto, Winnipeg, Vancouver, St. John

WRIGHT

High Speed Steel Hoists

When Work Goes Smoothly

BOWSER
ESTABLISHED 1885

Oil Storage Systems

assist in many ways to aid production, produce economy and efficiency wherever oil is used.

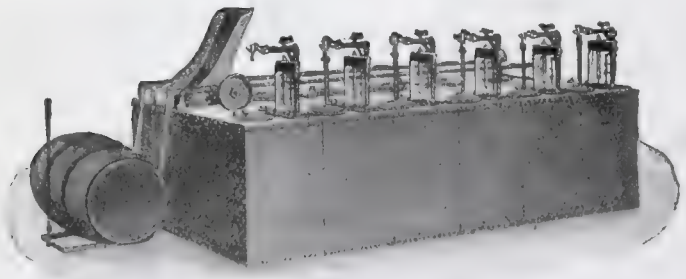
They provide effective storage and handling facilities for all kinds of oils. Keep oil clean, retain its value, prevent waste, and encourage the proper use of oil, which results in better work with less effort.

Outfits can be placed where most convenient, saving time and trouble.

They are accurate, durable and safe; every shop needs the Bowser.

S. F. BOWSER & Co., Inc.

Sales Offices In all Centers **TORONTO, ONT.** Representatives Everywhere



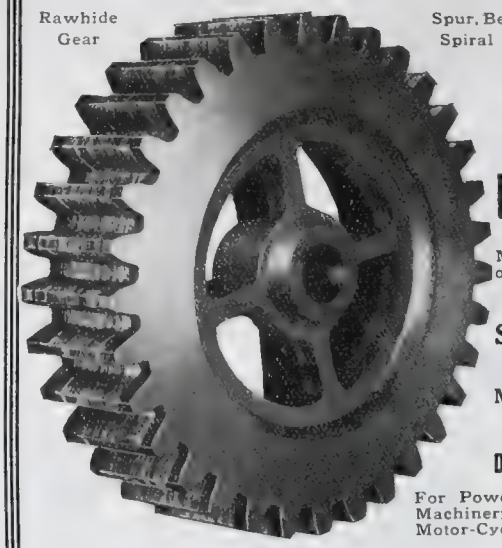
A System for Every Need

Philadelphia GEAR Works

Vine St., Philadelphia, Pa. U.S.A.

Rawhide Gear

Spur, Bevel, Herringbone Spiral and Intermittent



GEARS AND PINIONS

Made in all kinds of Metals, Rawhide and Fibre.

SPROCKET WHEELS
Made To Order

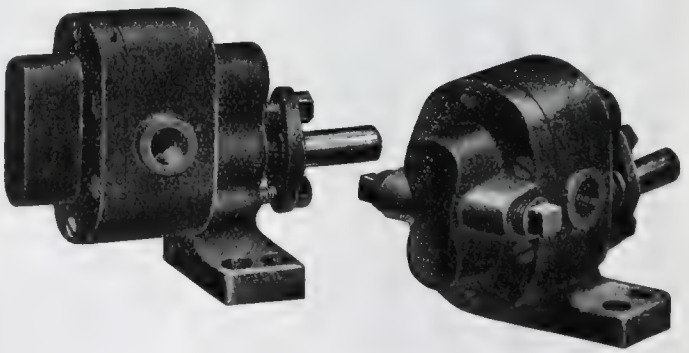
Distributors of
DIAMOND CHAINS

For Power Transmission' Machinery & Motor Trucks Motor-Cycles and Bicycles

We ship GEARS to all parts of Canada.

Write us when you want good gears, good service.

Get our Gear Catalog: "ALL ABOUT GEARS."



Circulating Pumps

Eliminate the separate relief valve and its necessary piping by installing the Roper Circulating Oil Pump. But, you say, why install a new system when the present is good enough? This "good enough" article may appear to be giving satisfaction, *but,* is it giving the best to be obtained. Can you speed up without any fear? With a Roper you need not have any fear of any kind. The oil flows from it in a steady, even stream, and there you can speed up to full capacity and let her go feeling confident.

Inquire. You will get valuable information anyway.

C. F. ROPER & CO.
Hopedale : Mass. : U.S.A.

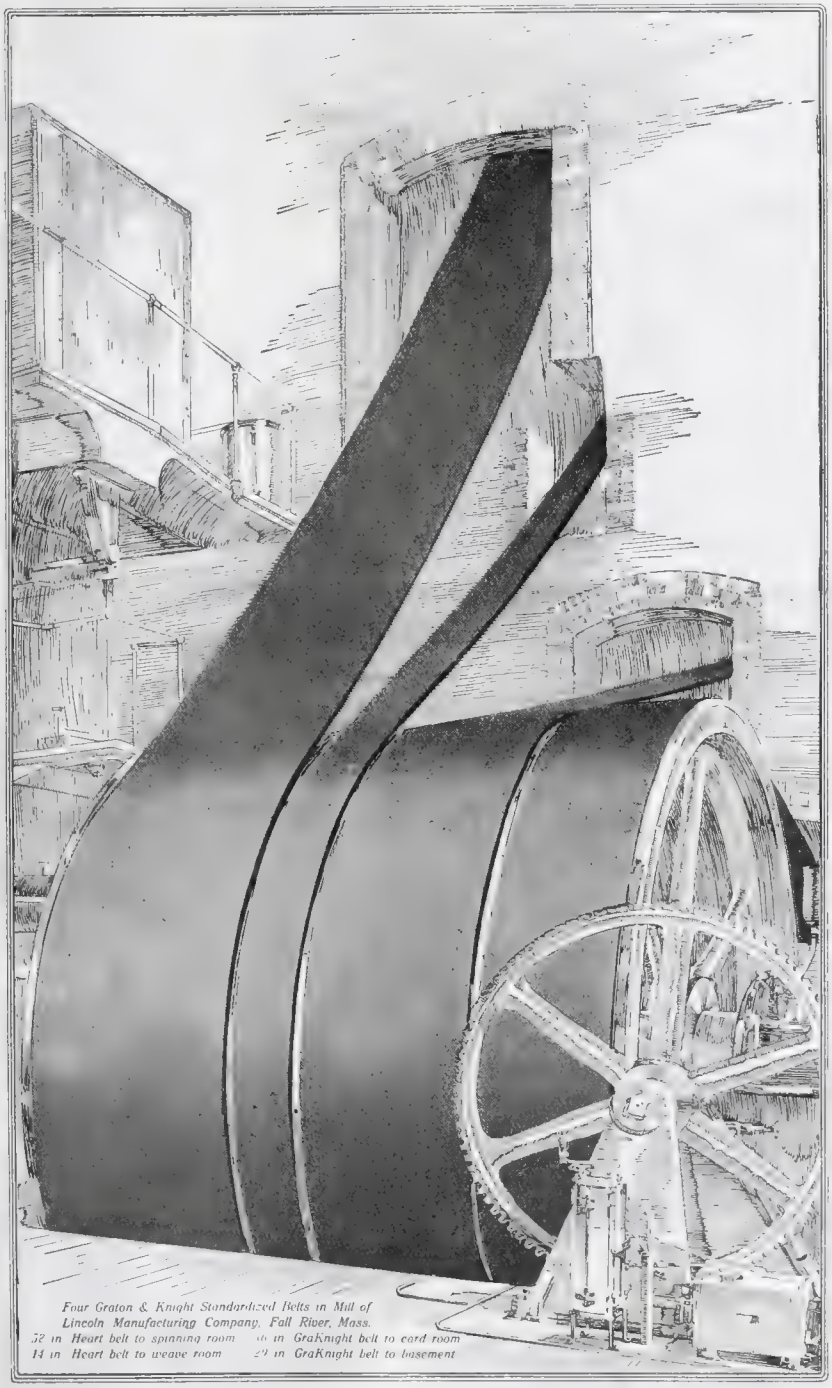
If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

GRATON & KNIGHT

Standardized Series

LEATHER BELTING

Tanned by us for belting use



Four Graton & Knight Standardized Belts in Mill of Lincoln Manufacturing Company, Fall River, Mass.
52 in Heart belt to spinning room — 46 in GraKnight belt to card room
14 in Heart belt to weave room — 29 in GraKnight belt to basement

Big Belts— For Big Jobs

There is one right way, and only one right way, to buy belting. That is on the basis of the *work to be done.* A big job needs a big belt.

If you buy it as you buy machinery — you will standardize it, as you have standardized your machinery. You will buy Standardized Belting.

Standardized Belts are made to the actual standards of the job. They have been worked out during sixty-six years of belting experience. The requirements of every kind of power transmission have been classified and a Standardized Belt evolved to meet the actual demands of each.

There is Graton & Knight Heart Brand, the standardized extra-heavy oak-tanned center stock belt — GraKnight, the standardized, medium-weight, oak-tanned center stock belt — GraKnight Dynamo, the standardized, light-weight, oak-tanned center stock belt—Neptune, the standardized, water-proof belting — Spartan, standardized for exacting conditions or difficult drives.

The way to save money on belting isn't to buy cheaper belts—but to buy the belt that will do your work best.

Apply Standards to your power Transmission. Our Engineers are at your service—let them help you standardize your belting.

The Graton & Knight Mfg. Company

Oak Leather Tanners, Makers of Leather Belting, Lace Leather, Leather Packings and Sundries

Worcester, Mass., U S.A.

Canadian Representatives: The Canadian Fairbanks-Morse Co., Limited, St. John, Montreal, Ottawa, Toronto, Hamilton, Quebec, Calgary, Edmonton, Vancouver, Windsor, Winnipeg, Victoria.

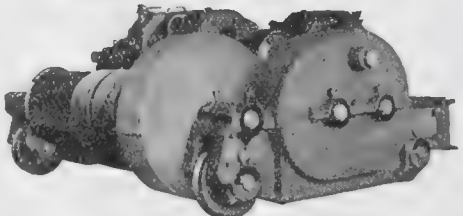
GRATON AND KNIGHT

CANADIAN MADE

Electric and Hand Traveling Cranes

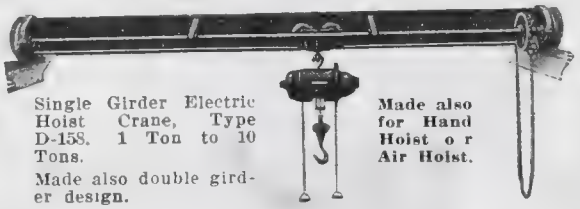
CANADIAN MADE

Type E—3-Motor Electric Travelling Crane, 2 Tons to 100 Tons.



Northern Type E Crane Trolley, Rigid, Enclosed Construction. Patented in Canada.

We make a wide range of CRANE and HOIST designs. All sizes and capacities, 1 ton to 100 tons.



Single Girder Electric Hoist Crane, Type D-158. 1 Ton to 10 Tons.

Made also double girder design.

Made also for Hand Hoist or Air Hoist.

Get our prices and specifications before you buy.

In asking prices, state SERVICE, CAPACITY, SIZE OR SPAN POWER, and, if electric, KIND OF CURRENT.

Catalogs free.

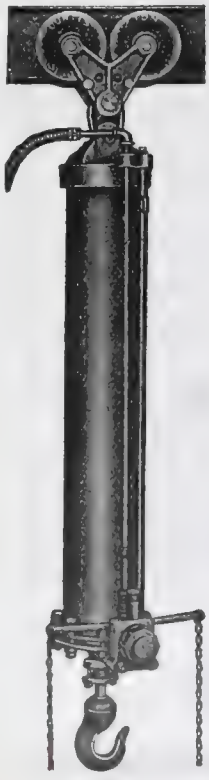
Type D Electric Hoists —½ to 10 Tons.

Air Hoists, Trolleys and Tracks.

Type No. 20 Air Hoist.

Northern Crane Works, Limited

Walkerville, Ontario, Canada



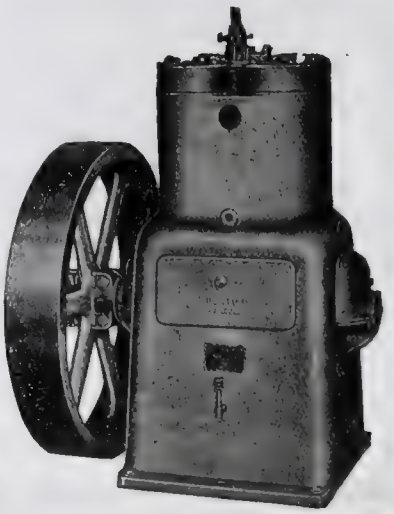
CURTIS, St. Louis, U.S.A.

AIR COMPRESSORS — AIR HOISTS — TROLLEYS AND TROLLEY SYSTEMS—SAND BLASTS—PNEUMATIC AND HYDRO-PNEUMATIC ELEVATORS—JIB AND TRAVELING CRANES.

We have specialized for over 22 years on pneumatic machinery. We have developed the simple air cylinder into a straight line motor with wonderful speed control and dependability capable of the widest application to hoisting problems.

Our new controlled-splash oiling system with regulatable sight feed cylinder oiling is something entirely new in air compressor design.

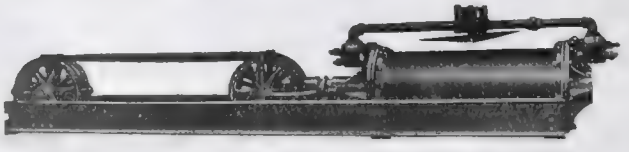
Complete catalogs and descriptive circulars on our entire line furnished on request.



Curtis Pneumatic Machinery Co.

1585 Kienlen Avenue - St. Louis, U.S.A.

New York Office - 532F Hudson Terminal



If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

"Pioneer"
STEEL HANGERS
Have Taken The Hard Work Out of Shaft Hanging
There was a time when hanging shafting was a back-breaking job.
Now it is different—because "Pioneer" Steel Hangers weigh about one-third as much as the old-style cast iron.
The cost of the millwrighting is also very materially reduced and the "Pioneer" does not break—Never.
Its price is no higher.
Ask for a copy of our new booklet "Transmission Data". Contains some plain truths worth reading.

Standard Pressed Steel Co., Philadelphia, Pa., U.S.A.

Sole Distributors for Ontario

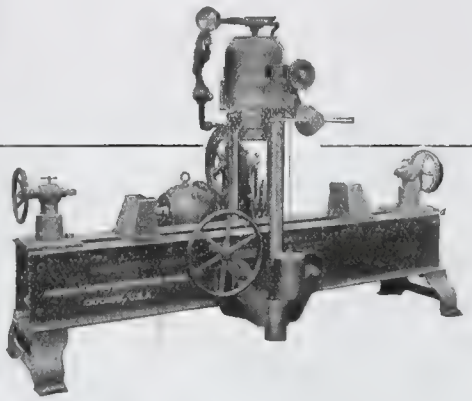
H. W. Petrie, Limited, Toronto, Ontario

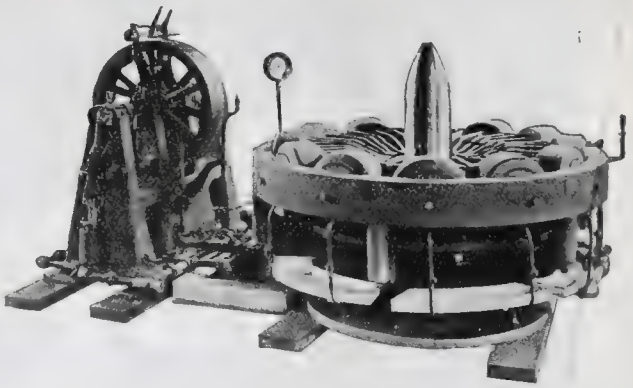
ELMES

Motor Driven Straightening Press for shafts up to 5 in. Movable head, height adjustable, close regulation of action, strong screw centre parts. One of our many types.

Charles F. Elmes Engineering Works.

217 N. Morgan St. Chicago, U.S.A.





The New "West" Banding Press

For 9.2" and 8" shells

12 Cylinders; Ample Power; Ample Strength; Reasonable Price.

NO ACCUMULATOR REQUIRED.

The West Tire Setter Co.

255 Mill Street, Rochester, N.Y.

Speed

When the quality of the work is the best obtainable, the next item is speed. For upon speed depends your costs.

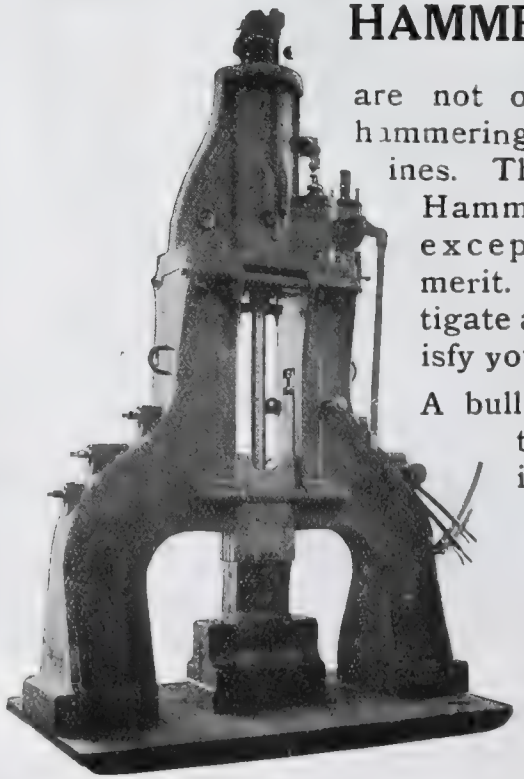
One rivet per second is the speed this machine will maintain indefinitely. Adapt that speed to your requirements and find out the value the Grant Riveter would be to you.

Write for our catalogue. It will give you complete information.

Grant Mfg. & Machine Company

Bridgeport, Conn., U.S.A.

"ERIE" STEAM FORGING HAMMERS



are not ordinary hammering machines. They are Hammers of exceptional merit. Investigate and satisfy yourself.

A bulletin for the asking.

ERIE FOUNDRY COMPANY

ERIE, PENNSYLVANIA, U. S. A.

A time saver
Can you beat it?

HAVE you noticed the Consolidated Clamp Connection on all Consolidated Presses, grips like a vise and stays put, one of the bull-dog kind, which, when properly tightened, will not break away, or slip.

If you break it we will furnish a new one free of charge.

Consolidated Press Company

HASTINGS *LARGEST EXCLUSIVE MANUFACTURERS OF POWER PRESSES IN U.S.A.* MICHIGAN

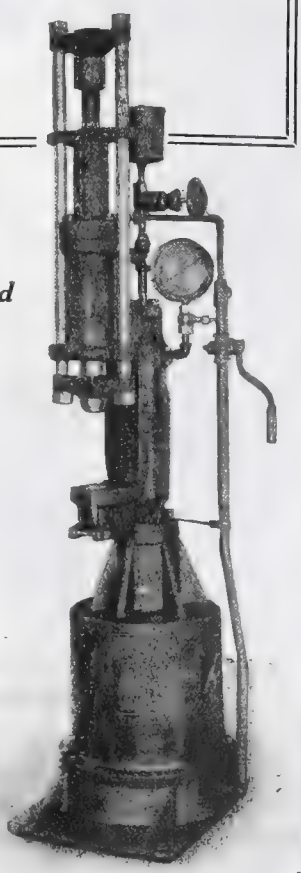
Canadian Representatives: A. R. WILLIAMS MACHINERY CO., Limited, Toronto, St. John, Winnipeg, Vancouver

Triple Purpose

"METALWOOD" COMBINATION

Forcing, Broaching and Straightening Press.

Its value is in the many uses to which it is adaptable. Auxiliary tables and fixtures add greatly to its usefulness. It is not "encumbered" with a single excess part. Built for production.



Metalwood Mfg. Co.

Leib & Wight Sts., DETROIT, MICH. U.S.A.

For Great Britain and Continent address Gaston E. Marbaix, Coronation House, 4 Lloyds Ave., London, E.C., England.

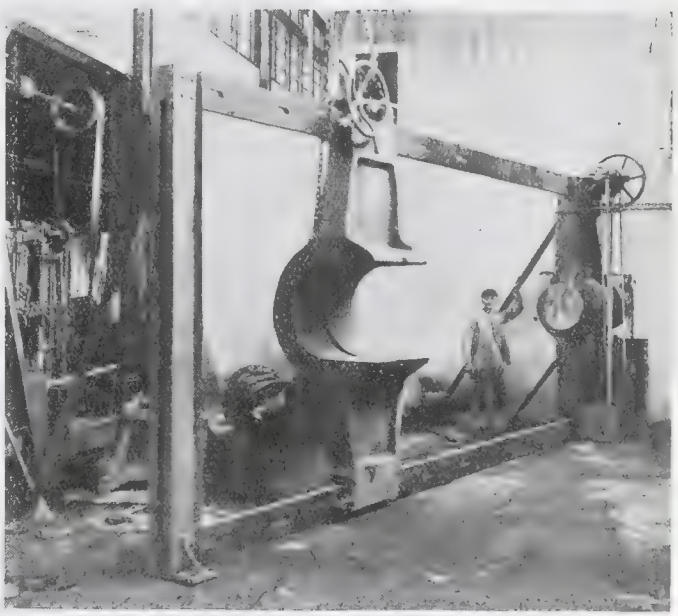


Illustration shows Hydraulic Press for Government Shipbuilding Plant, Sorel, Que.

Hydraulic Presses, Pumps and Accumulators for all Purposes.

Write for Prices and Deliveries.

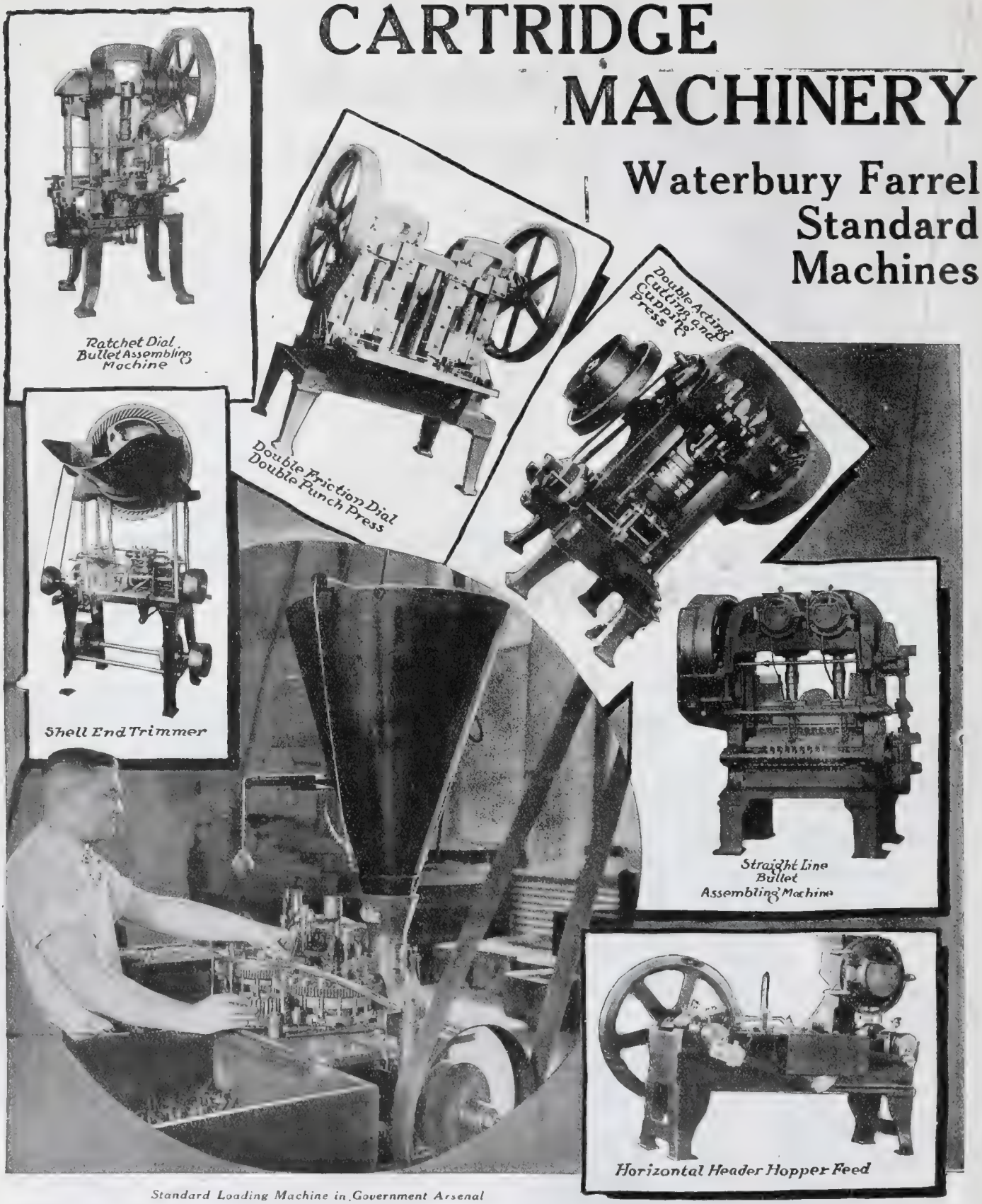
WM. R. PERRIN, LIMITED

TORONTO, CANADA.

If any advertisement interests you, tear it out now and place with letters to be answered.

CARTRIDGE MACHINERY

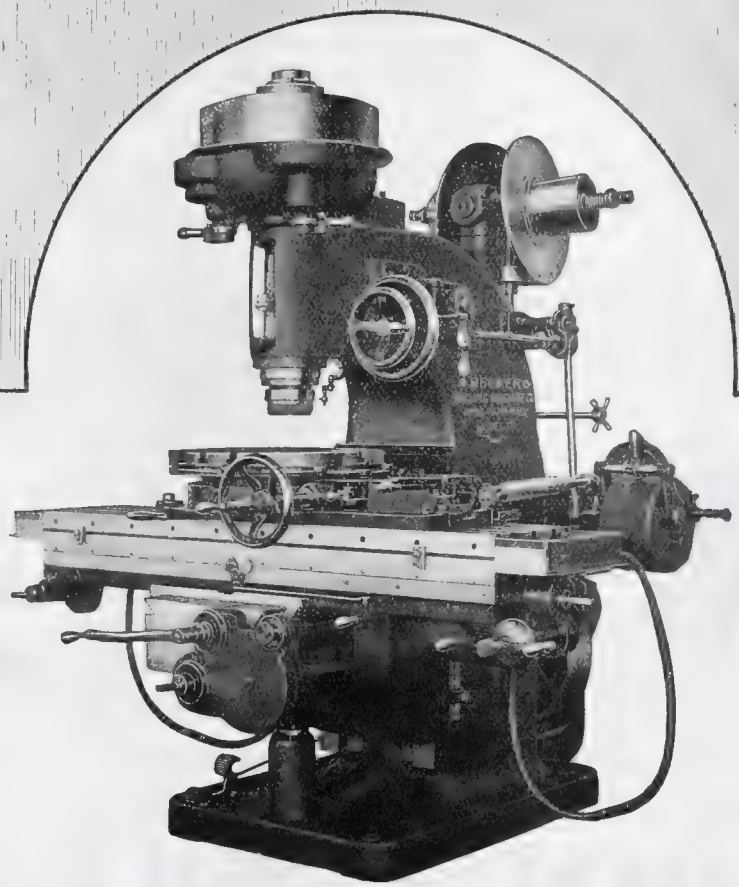
Waterbury Farrel Standard Machines


Ratchet Dial Bullet Assembling Machine
Double Friction Dial Double Punch Press
Double Acting Cutting and Cupping Press
Shell End Trimmer
Straight Line Bullet Assembling Machine
Horizontal Header Hopper Feed

Standard Loading Machine in Government Arsenal

The Waterbury Farrel Foundry & Machine Co., of Waterbury, Conn., U.S.A., has appointed me to be the sole manufacturer for export of their entire line of Cartridge and Shot Shell-Making Machinery. Proposals and Estimates covering complete plants or separate units, required for export will be furnished on request.

FREDERICK S. BLACKALL, Woolworth Tower, New York, U.S.A.



Selling Price *vs.* Production

Quantity production regulates the selling price. Quantity production also regulates the profit you make to meet competitive prices. When you have quality, does not your selling price control the market? We wish to consider your milling costs.

Comparative tests have always resulted in the Becker proving decidedly superior in quantity and quality production. The fixtures (not encumbrances) give an added ability of 40 to 360%. Your work comes within that range of actual saving. Let us co-operate with you.

Becker Milling Machine Co.

HYDE PARK, BOSTON, MASS., U.S.A.

Agents:

The A. R. Williams Machinery Co., Limited, Toronto and Hamilton
Williams & Wilson, Limited, Montreal, Que.

If any advertisement interests you, tear it out now and place with letters to be answered.

The Cincinnati Number 1 Cutter Grinder

For the medium and smaller sizes of spiral mills, end mills, side mills, angular cutters, etc.—in other words—for the cutters which are used most extensively—this No. 1 Grinder has been popular for many years.

Practically every shop of any consequence has at least one. Many large shops use dozens. They find it just as valuable for sharpening reamers as it is for sharpening cutters.

It is handy. Can be quickly set to any angle. The knee carrying the table swings through a complete circle, and in addition, the table may be set at an angle with the slide. Has graduated dials for all settings, and the lever feed can be operated from any position handiest for the work being done.

We are offering these machines for quick shipment

The Cincinnati Milling Machine Co.
Cincinnati, Ohio

Canadian Agents: H. W. Petrie, Ltd., Toronto, Ont.; H. W. Petrie, of Montreal, Ltd., Montreal, Que.: Taylor Engineering Co., Ltd., Vancouver, B.C.; General Supply Co., of Canada, Winnipeg, Man.

GARVIN

NO. 12 PLAIN MILLING MACHINE

FOR ALL LIGHT MANUFACTURING

No. 12 Plain Milling Machine—Use Code Abrade

This machine is built especially strong and substantial for a tool of its capacity, and has many valuable features worthy of special mention. The slide is fitted with a quick pitch screw, giving one inch per turn. This combines the rapidity of a rack feed with the steadiness of the screw feed. The table has an oil pan all around it, with finished edges—automatic feed, trip and reverse—adjustable nut on the feed screw to take wear—the Feed Screw is hardened.

Adjustments.....18 x 6 x 15 in.

For Further Information { ASK YOUR DEALER or WRITE US DIRECT

IMMEDIATE DELIVERIES

Send for Complete Catalog

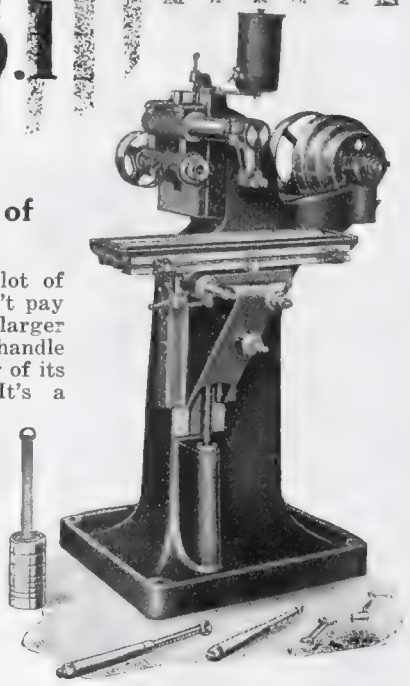
Manufactured by

THE GARVIN MACHINE COMPANY

Spring and Varick Streets (***Visitors Welcome***) **50 Years New York City**

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

U.S. Milling Machine No. 1



Capable of
Wide Range of Work

You can handle a lot of work that it wouldn't pay you to put on a larger machine and it will handle work no other miller of its size can touch. It's a little machine with a big capacity—an economy worker.

United States Machine Tool Company
Cincinnati, Ohio, U.S.A.

Universal Gear Hobber

The machine which completes our lines to cut all types of small gears except internal, within 10″ dia. 8 Pitch.

The Bilton Gear Hobber will cut spur spiral gears, worm gears, also various special shapes of teeth. It can cut a spiral gear on end of a shaft 1⅜″ diam. 24″ long.

SPECIFICATIONS

Capacity Gears: 10 Diametral Pitch
10 in. Outside Diameter
10 in. Width of Face
Range of hob feed 50-250 R.P.M.
Range hob feed to each rev. of worm .010 to .125
Drive: 3 Steps Cone Pulley; 2½ in. Belt
Weight 2,100 lbs.

A machine of latest design, introducing new features which increase production without sacrificing accuracy. The hob is cutting continuously; operation of machine entirely automatic.

DELIVERY

A few of these machines are now available for October delivery.

Send for copy of new catalog No. 30, and bulletin describing this machine.

The Bilton Machine Tool Co.
Bridgeport, Conn.

Foreign Agents: Alfred Herbert Ltd., M. Mett Engineering Co., Chas. Churchill & Co.

For Rapid Production and Accurate Work

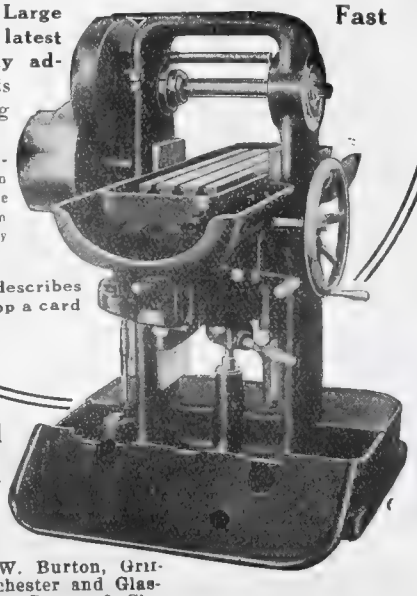
USE THE
"BRIGGS"

The Briggs Miller handles work no other machine of its size can touch. It is a manufacturing machine. On account of its rigid construction it will produce accurate work when running at a high rate of speed and feed.

The Base Tank and Large Gear Pump is the latest addition to its many advantages. Tank holds 20 gallons of cutting lubricant

Pump never requires priming and will deliver ten gallons per minute to the cutters, keeping them cool when run at very high speed.

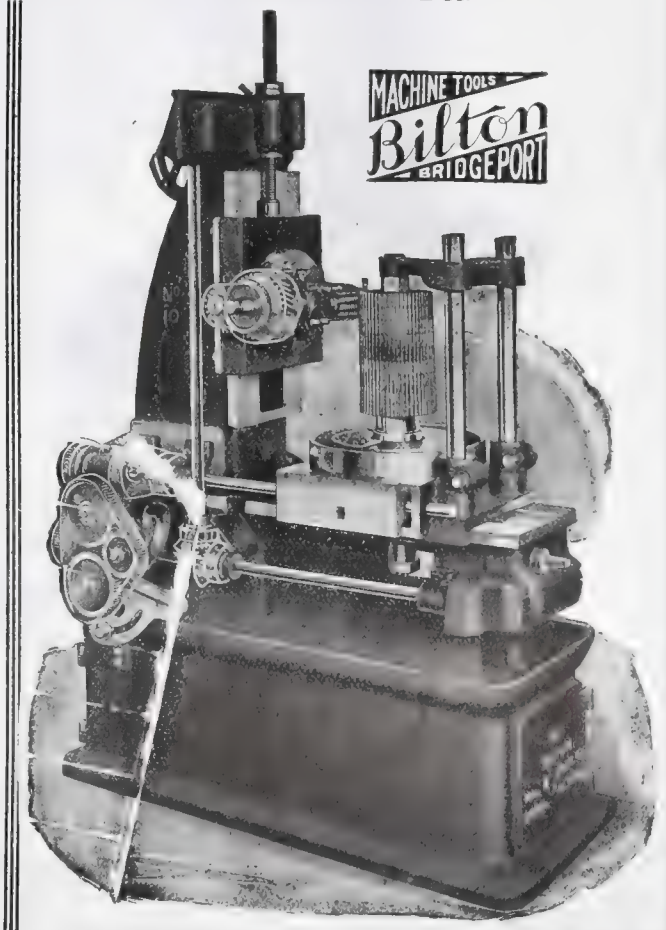
Our booklet describes fully. Drop a card for it.



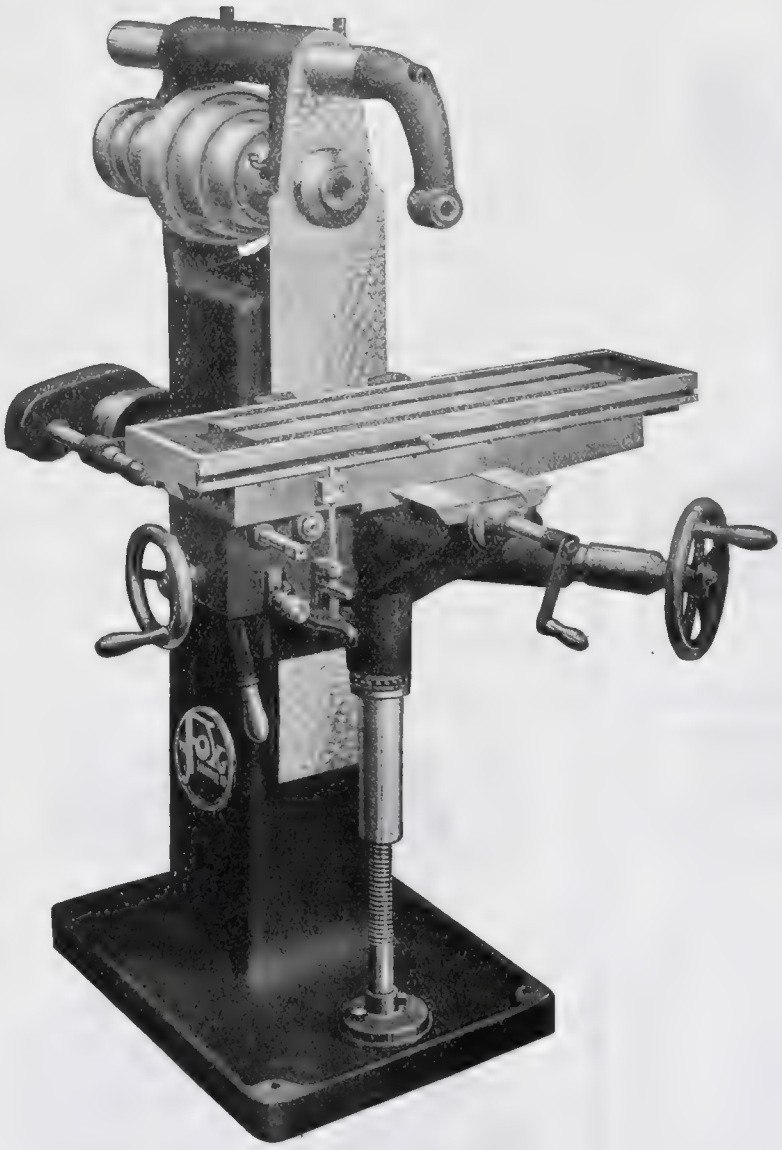
Fast

Gooley & Edlund Inc.
Cortland, N.Y., U.S.A

Foreign Agents: Allied Machinery Company of America, France, Belgium, Italy, Switzerland, Russia, Scandinavia, C. W. Burton, Griffths & Co., London, Manchester and Glasgow, Barandiaran, Metivier, Gazeau & Cia, San Sebastian, Spain.



The Fox Milling Machine
For Intense Production



Fox
MILLING MACHINES
lead the field

Power Feed
Milling No. 3

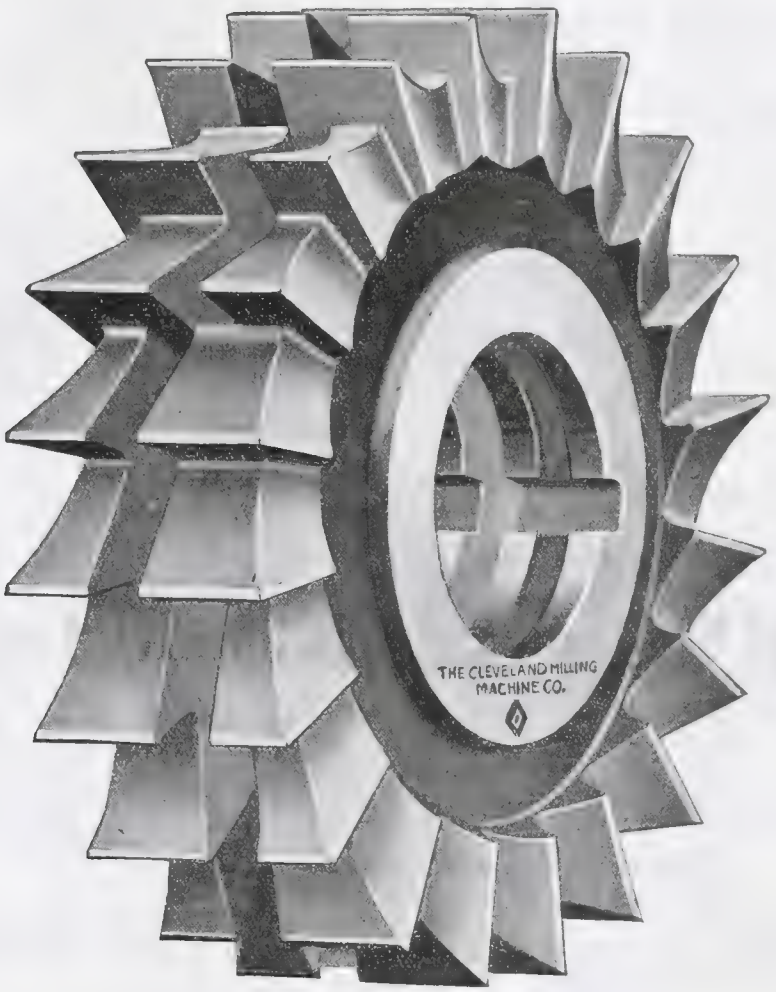
The Fox Milling Machines are ideal, as they are particularly adapted for just that sort of work.

Every machine is provided with micrometer dials on the vertical and transverse movements, thus insuring accuracy in every detail.

Write for full particulars.

FOX MACHINE COMPANY
1047 W. Ganson Street, Jackson, Michigan

Milling Cutters Milling Machines Relieving Machines



The great ideal of service is uppermost in the mind of every man who has anything to do with the manufacture of this cutter, from the selection of the steel to the final inspection. Even then we do not consider the cutter finished until it has proven to your entire satisfaction that it is really the best cutter made.

Service Courtesy

We have a complete stock of Standard Cutters

IMMEDIATE DELIVERY

THE CLEVELAND MILLING MACHINE CO.

Cleveland, Ohio

If any advertisement interests you, tear it out now and place with letters to be answered.

HALL

Pipe Threading Machinery
AND
Shell Cutting-off Machines

This illustration shows the new No. 8 Hall Gear Box Driven Pipe Lathe. Regular Capacity 2½″ to 8″ inclusive.

The last word in Pipe Machine Construction

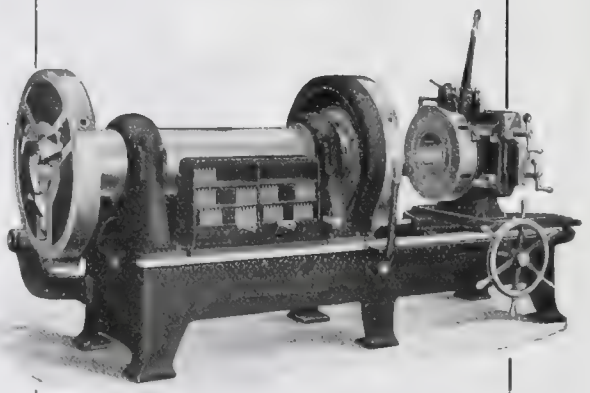
Let us give you full particulars of this machine which is only one of a large number having capacity ⅛″ to 18″ pipe.

Write us for catalog and prices on:

Pipe Threading Machines Nipple Threading Machines
Roller Pipe Cutters
or
Cutting-off Machine for shells or bar stock.
Any capacity ⅛″ to 18″.

John H. Hall & Sons, Ltd.
BRANTFORD, CANADA
EUROPEAN AGENTS:
Universal Machinery Corporation, Limited, London

Made in Canada



Capacity
2½" to 8"
inclusive

Tel. Main 6755 Jos. Bickerstaff, Mgr.

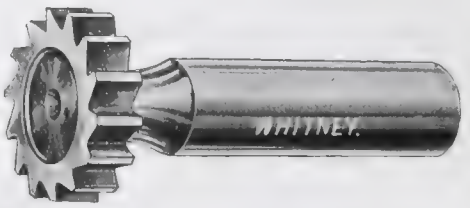
THE ELM CUTTING OIL COMPANY
645 East King Street
TORONTO

You have tried the rest. Now use the best for screw cutting and threading.

Our standard is uniformity at all times and a guarantee of quality with every barrel of oil produced.

PRICES ON APPLICATION

"WHITNEY"
KEY-SEAT CUTTERS
For the Woodruff System of Keying
GET OUR PRICES



Either carbon or high-speed steel Material the best obtainable. Unsurpassed in efficiency and durability. Centred at both ends. Unsurpassed in accuracy and finish. Large quantities carried in stock.

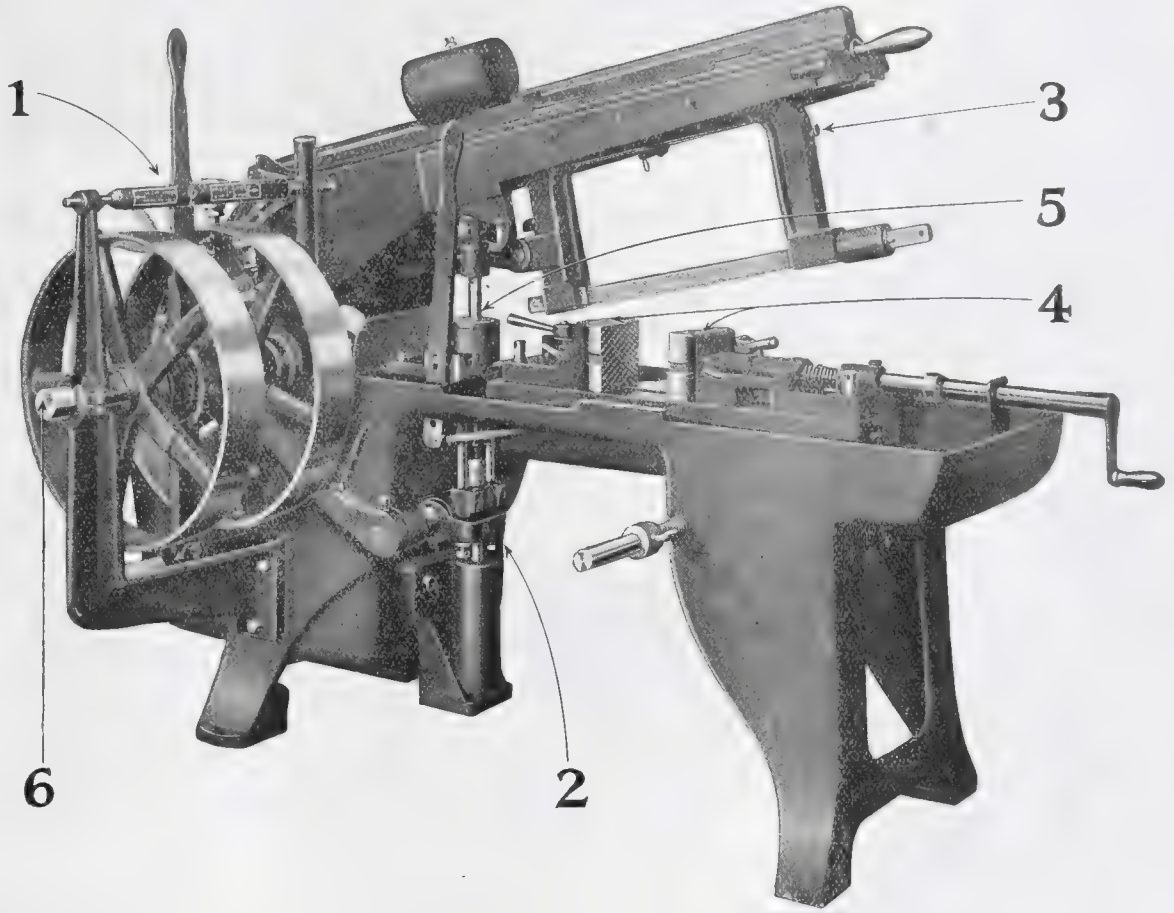
The Whitney Mfg. Co., Hartford Conn.
Chains, Keys and Cutters, Hand Milling Machines

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

Distinctive Features

of the V.S.W. No. 5

High Speed Hack Saw Machine



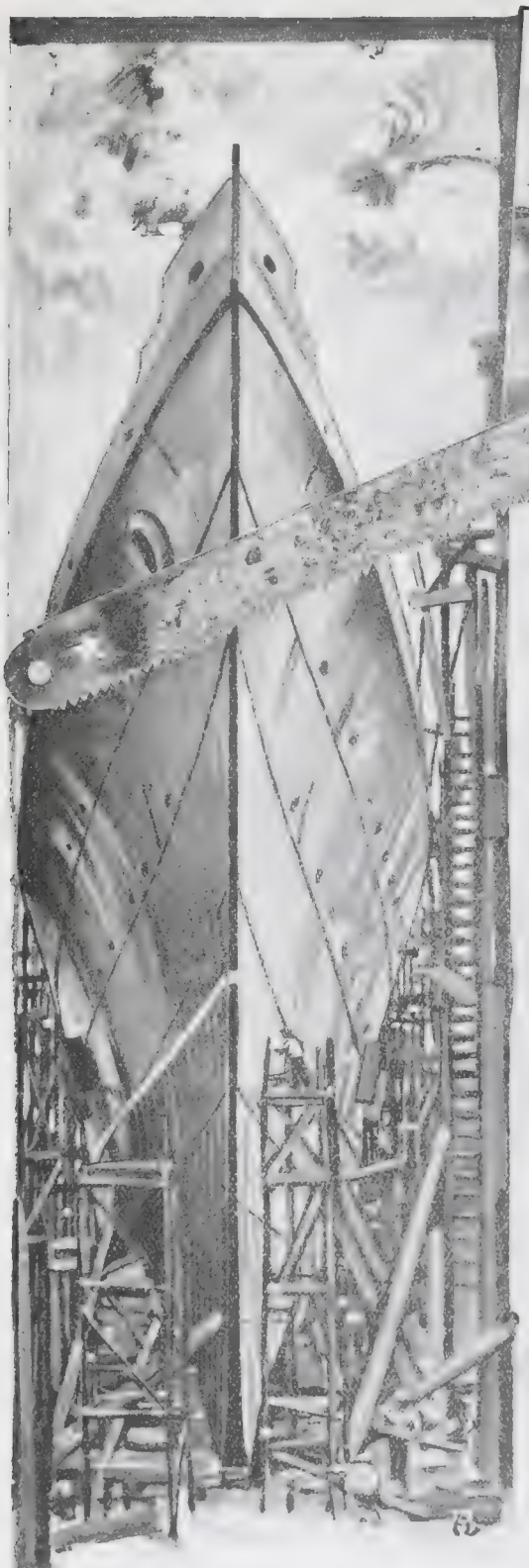
DISTINCTIVE FEATURES

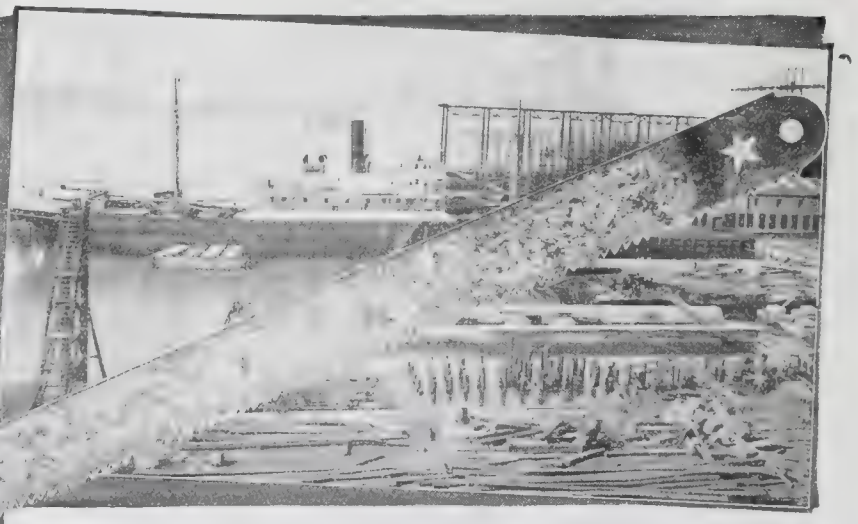
1. Two Speeds
2. Shock Absorber
3. Extension Frame.
4. Patent Swivel-Jawed Vise
5. Automatic Patent Lift.
6. Frame Swings on Shaft Center.
7. Rotary Pump
8. Knock-off.
9. Frame Bearings
10. Tank.
11. Perfect Blade Alignment
12. Lubricating System
13. Draw-Cut.

For Explanation of these and other features send for Circular

VICTOR SAW WORKS LIMITED

HAMILTON, CANADA





Cramp Uses Star Hack Saw Blades

OF all the American Shipyards now building our enormous tonnage at top speed to defeat the German U-Boats, none is more famous for efficiency than Wm. Cramp and Sons of Philadelphia.

In giving Star Hack Saws the endorsement implied by use, Cramp has paid Star Blades the highest compliment because a great shipyard has probably a greater variety of difficult metal sawing than any other plant and is constantly driven at topmost speed to get the boats built on time.

You too can put Star Blades to as drastic tests as you like. They will do your most difficult cutting in minimum time and minimum cost. Star Blades are made for every purpose—machine and hand—flexible and all hard. And always they will give you maximum output at the lowest price per cut—which is the one real test of hack saw blade efficiency.

STAR HACK SAW BLADES

Machine and Hand ***Flexible and All Hard***

Star Blades were the first modern hack saw blades and the Star supremacy has been maintained by thirty years of constant metal-cutting research.

Our knowledge of the best steel composition and tempering—the best length, width and thickness—and the best shape and setting of teeth for all conditions has been gained at the cost of hundreds of thousands of tests. The uniformity with which Star Blades are made has come from years of machine development which has produced our special automatic machinery with gauges of such fine limits that the least variance is mechanically impossible.

It is a fact of vital importance to every user that the standard practice now used by other hack saw makers was abandoned by us more than twenty years ago for our present more efficient methods.

Put your metal-cutting problems up to us and we will give you the benefit of our thirty years of research and help you get the greatest output at the smallest cutting cost.

Address Engineering Department, Millers Falls Co., 230 Rivers St., Millers Falls, Mass.

$500.00 FOR YOUR EXPERIENCE

Our position as authorities on metal sawing efficiency has made us a national clearing house of information on the results blade users are getting under all classes and kinds of conditions. To encourage this clearing house idea, we offer $500.00 in gold for the best articles on "How I Test Hack Saws."

Tell us your methods in detail (either on machine or hand blades) and give us your conclusion with absolute truth and frankness, including some of the records of your results. It is not necessary to be a Star user to win a place in this prize award. We want your experience, whatever it is. Get your reply in as early as possible. Contest closes at Millers Falls, Nov. 30. The best replies will be published in book form and in our advertising.

1st Prize	$250.00	3rd Prize	$50.00	5th Prize	$15.00
2nd Prize	100.00	4th Prize	25.00	6th to 11th Prizes each	10.00

Manufactured By
CLEMSON BROS.
MIDDLETOWN, NEW YORK

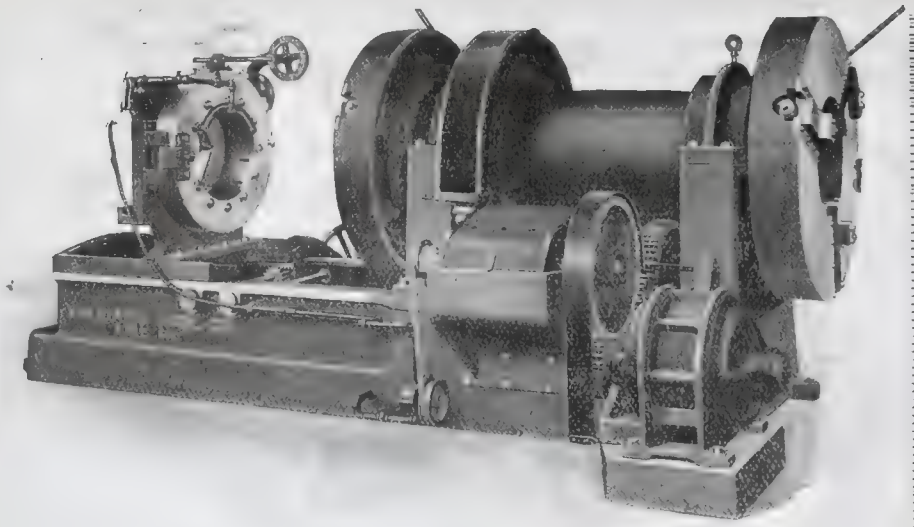
Sole Distributors
MILLERS FALLS CO.
MILLERS FALLS, MASS.

THE SUN NEVER SETS ON QUALITY SAWS

EVERY TOOTH CUTS
ON
EVERY QUALITY SAW
THEY CUT STRAIGHTER AND LAST LONGER

Canadian Representative:
F. Bacon & Company, Montreal, Canada

NAPIER SAW WORKS Inc.
SPRINGFIELD, MASSACHUSETTS U.S.A.



Highest Award Panama Exposition

Williams Tool Company

Erie, Penn., U.S.A.

Canadian Agents:
The A. R. Williams Machinery Co., Ltd., Toronto, Canada

European Agents:
Universal Machinery Corp. London, England

Pipe Machines

Threading

Cutting-off

Quality will tell in every test. At the Panama Exposition the Williams Cutting-off Machine was given the highest award. What does that mean to you?

It means that your pipe-threading and cutting-off operations will cease to give you any cause to worry if you are "Williams" equipped.

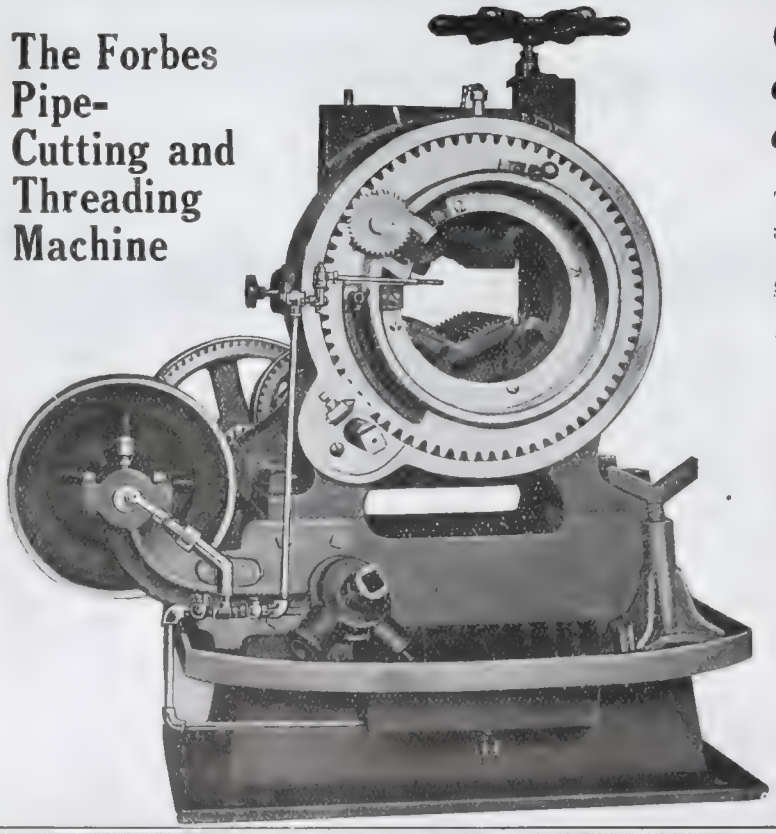
Made in 11 different sizes, each machine handling 8 to 10 consecutive sizes of pipe from ¼" to 18" dia.

Williams cutting-off machine is an investment, not an expenditure. It realizes exceptional dividends.

Write us at once!

CUTS THREADS FAST, CLEAN and TRUE

The Forbes Pipe-Cutting and Threading Machine



One man can do the work of six against old Stock and Die method of cutting

These are not exaggerated statements—they are facts that are being proven every day by Forbes' Users. Inquire for yourself. Investigate its performances closely and you can't help but admit its labor-saving, perfect-working value.

Inexpensive to Operate

It is simple, compact, self-contained, and all wearing parts are adjustable. One man can operate it and for heavy pipe work it can be taken right to the job.

Fitted with self-centering vise that holds the heavy pipe stationary, while the dies turn around it. The latter are clamped and released by a throw of the lever.

Write for our latest bulletin giving full details.

THE CURTIS & CURTIS CO.

Garden Street, Bridgeport, Connecticut, U.S.A.

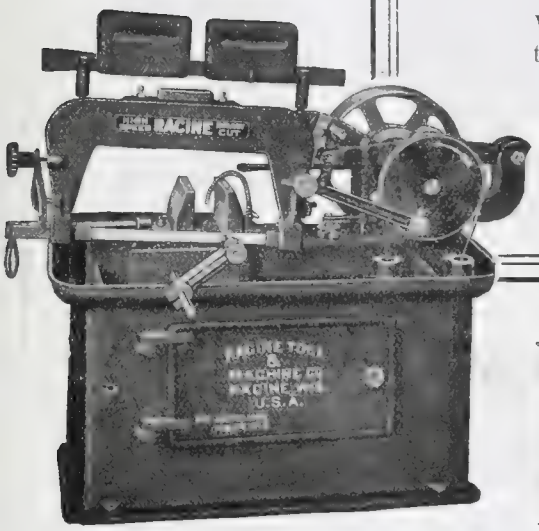
Known the World Over

Admitted to be Superior

The Racine for Scientific Metal Cutting.

Demonstrate the value of this machine in your own shop, on your own work. Our confidence in the ability of this machine is such that we will send it to you on *trial*. This will give you ample opportunity to study the machine from close quarters; to verify our statements regarding simple construction and operation, accuracy and speed, features that stamp our machine in a class by itself.

We invite your inquiries for full information and installation.



Racine Tool & Machine Co.

15 Melbourne Ave. **Racine, Wis., U.S.A.**

RACINE

THE IMPROVED

TAYLOR-NEWBOLD

INSERTED TOOTH COLD SAW

WRITE FOR BULLETIN T-S

Tabor Mfg. Co., Philadelphia, U.S.A.

DOUBLE SAVINGS

in cutting on PEERLESS HIGH SPEEDMETAL SAWS; they save both Time and Material.

Supposing you save only 1/16 on each cut, 200 lbs. of material are saved on 100 cuts of 12 in. round. Your savings may be several times 1/16.

Have you ever stopped to consider the waste of material in wide cuts, especially at the present high cost, will pay for a PEERLESS in a remarkably short time.

This is only one of the reasons for so many repeated orders and large concerns having standardized the PEERLESS. The many other reasons can only be fully appreciated after comparative test.

Write for a list of users; some of these machines may be working in your vicinity. A careful investigation always arouses enthusiasm.

PEERLESS MACHINE CO. 1607 Racine St. RACINE, WIS., U.S.A.

What Counts Save Results?

Embodied in the meaning of that word "Results" are—quality, quantity and the efficiency of the machine. So, when the quality is undoubted, speed is the primal requisite.

This No. 7½, Single Spindle Grinder, is built with unusually large dimensions throughout. The 30" disc wheel is interchangeable with the 20" ring wheel chucks. Spindle, 2¾" diameter and mounted in self-aligning radial and thrust ball bearings. The rocker shaft is 3½" diameter and supports two Lever Feed Tables. The 9" face of the pulley gives wonderful driving power.

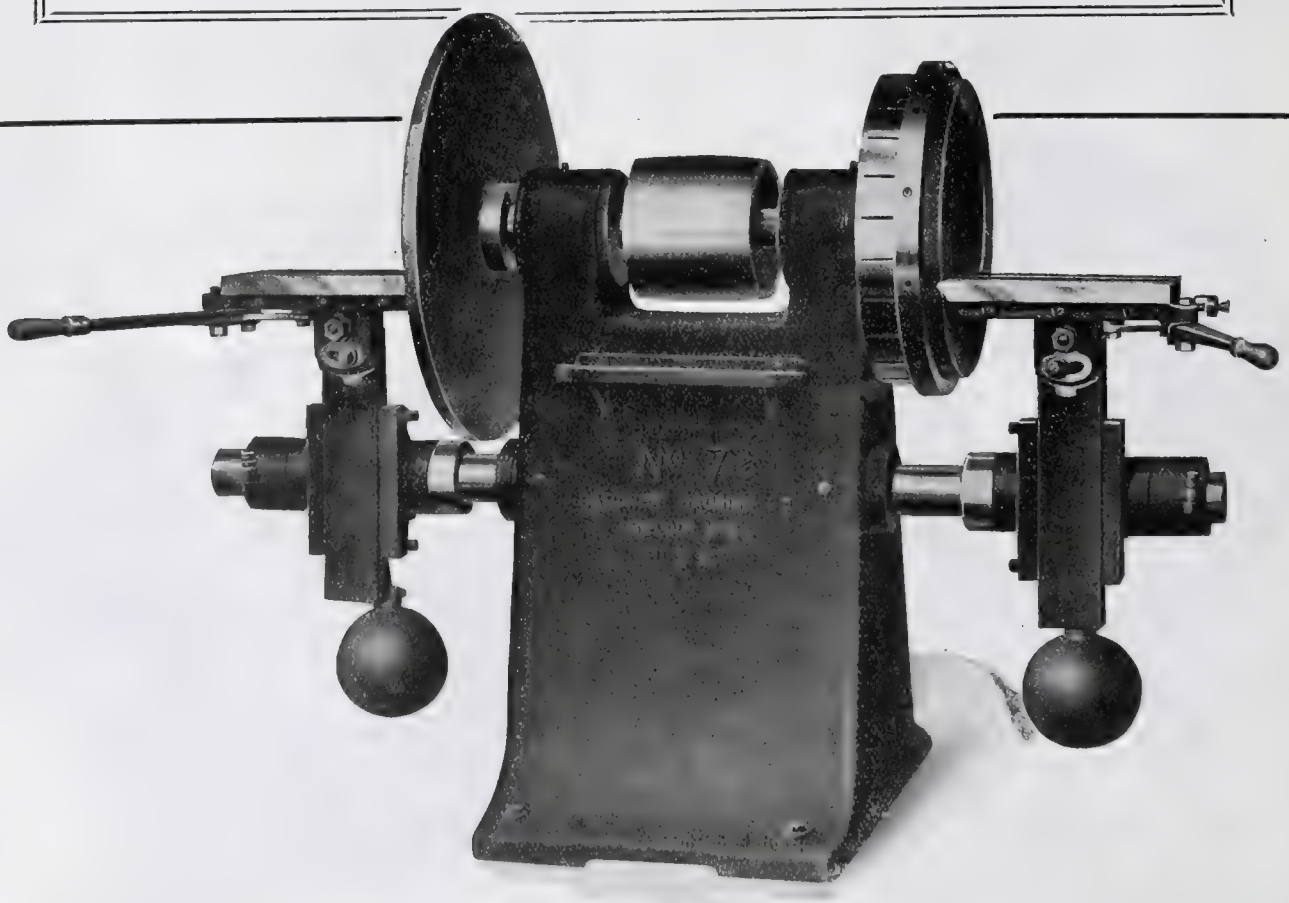
If you are not acquainted with the Gardner line of Single or Double Spindle Grinders, consider it a pleasure for us to supply you with all the information you desire. Our line is most comprehensive. We maintain a Service Department solely to give valuable service to the trade. Write us. We could help one another.

GARDNER MACHINE COMPANY

Beloit, Wisconsin, U.S.A.

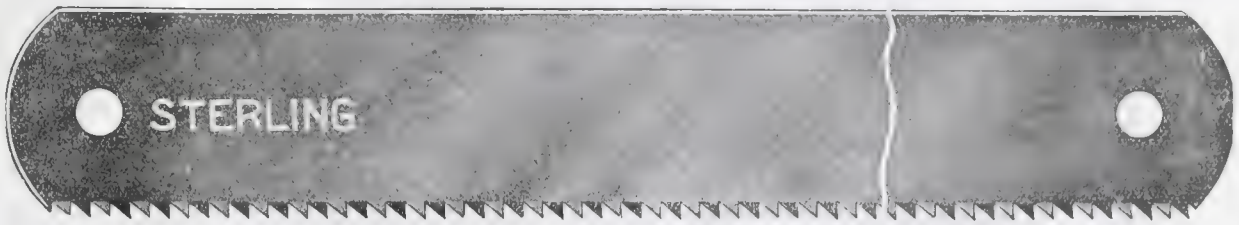
Canadian Sales Agents: **THE CANADIAN FAIRBANKS-MORSE COMPANY, LIMITED**

St. John, Quebec, Montreal, Ottawa, Toronto, Hamilton, Windsor, Winnipeg, Saskatoon, Calgary, Vancouver, Victoria



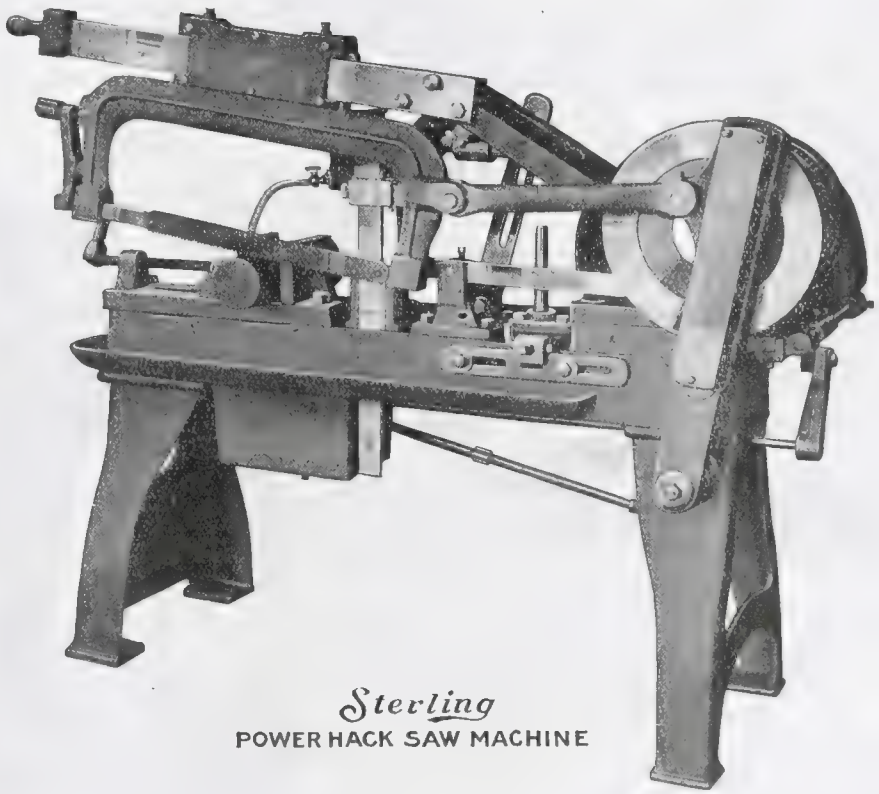
If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

"STERLING"



The man who knows, says this brand of Hack Saw Blade is good—he believes there are none better. The hand blades in all pitches are the best that can be made, also for power machines, they cut true, cut fast and last long. They give real value used in any first-class machine.

A combination of this blade with a "STERLING" No. 5 High Duty Power Hack Saw Machine is a real winner, and for cutting shell and shrapnel material has no superior.



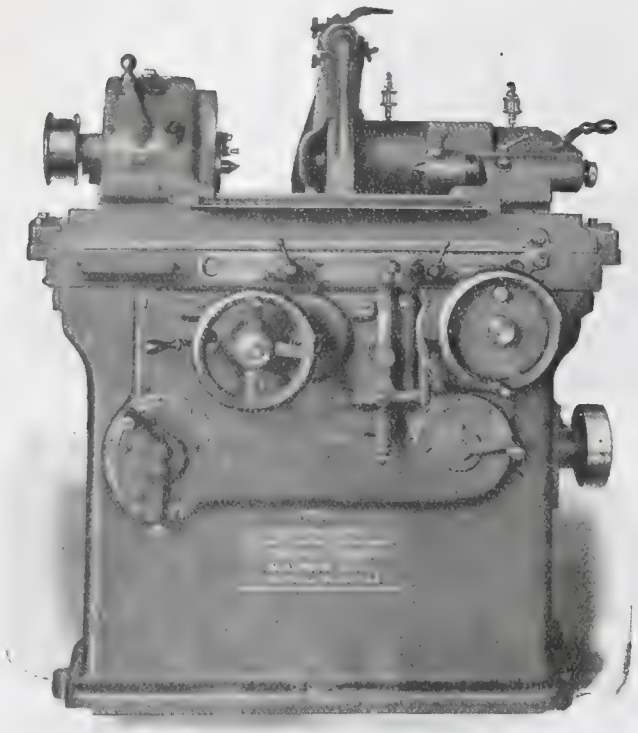
Sterling
POWER HACK SAW MACHINE

Manufactured by

DIAMOND SAW & STAMPING WORKS

357 SEVENTH STREET BUFFALO, N. Y., U. S. A.

If any advertisement interests you, tear it out now and place with letters to be answered.



MODEL "A"

Cylindrical Grinding

Model "A" Grinding Machine for straight or taper cylindrical grinding is a machine ideal because of the following few facts:—occupies only 52" x 66" space; requires 7 h.p. to operate 640 r.p.m.; three speeds, 1,300, 1,500 and 1,800. Constructed on the unit system, each part is removable. Our catalogue contains all the facts in detail and is yours by simply writing us.

Fitchburg Grinding Machine Co.
Fitchburg, Mass., U.S.A.

TOOL GRINDING

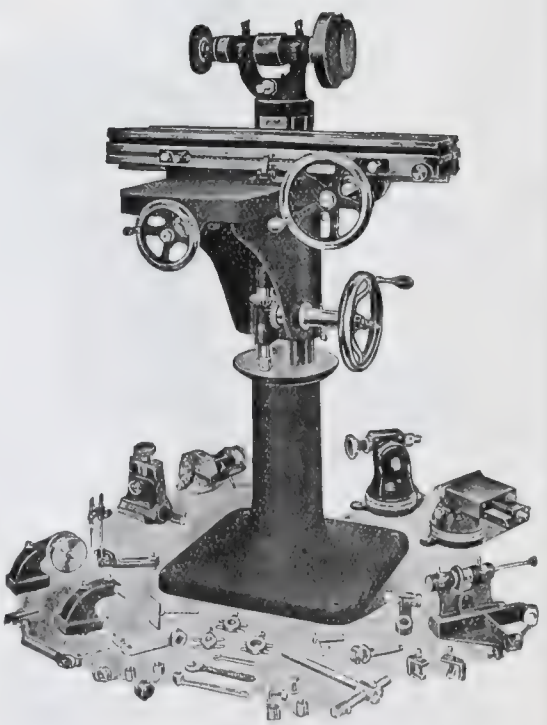
Milling Cutters, Reamer Counterbores, etc.

can be most conveniently sharpened on the various attachments furnished with the

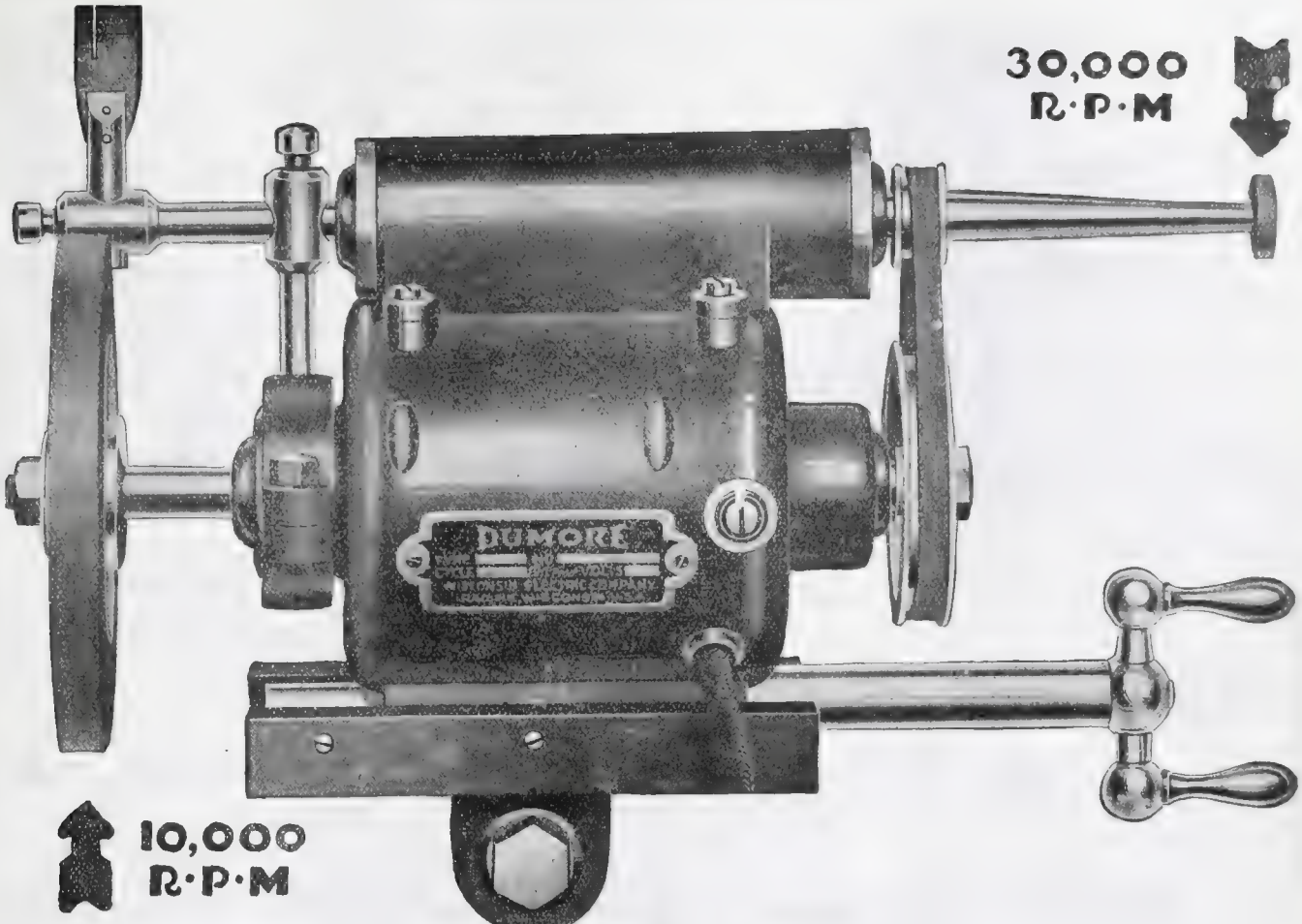
Greenfield

These Attachments are simple, practical and require no complicated adjustments, each being complete in itself. This feature alone will save a vast amount of time in "setting up." We claim, and we believe with perfect justice, that there is no other tool grinder that can be shifted from one job to another as easily and quickly as this one

We are always glad to send out catalog which illustrates each attachment in actual use. It might have some suggestions for you.



Greenfield Machine Company
Greenfield, Mass, U. S. A.

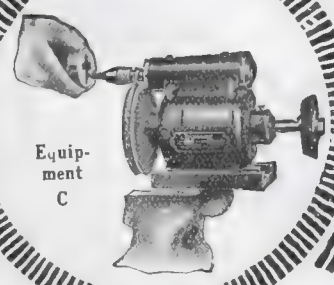


Dumore Grinders are used in thousands of manufacturing plants and machine shops. Used especially for grinding tools, gages, dies and similar work. For efficiency, investigate these grinders and the wide range of work they do.

30,000 R.P.M.! That's the first thing that interests every manufacturer because there is no other portable grinder that makes such high speed.

This high speed is made practical by dynamically balancing the armature. The high speed prevents the wheels from breaking down and insures extreme accuracy.

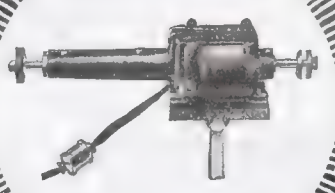
DUMORE PORTABLE ELECTRIC GRINDER


Equipment C

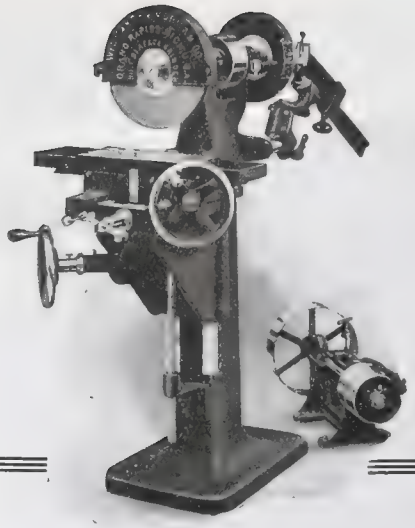
Three types of Dumore Grinders are made as shown here. All types are fitted with SKF Ball Bearings and equipped with the well-known Dumore Universal Motor, operating on either direct or alternating current.

Any one of these grinders will be sent to you on approval. Use it, then decide—that's how Dumore sales are made. State voltage of your current when ordering. Literature on request.

WISCONSIN ELECTRIC CO.
1715 Dumore Bldg., Racine, Wis.
Sold in England by Canadian American Machy. Co., Ltd., 8 Bouverie St., London, E.C., Eng.


Equipment B

If any advertisement interests you, tear it out now and place with letters to be answered.



Wilmarth & Morman No. 1

Big Production Surface Grinder

for

Immediate Delivery

Rigid—Accurate
Convenient

Capacity 6 in. x 14 in. x 10 in.

Circular on Request.

Wilmarth & Morman Co.

Makers of

DRILL GRINDERS—SURFACE GRINDERS
UNIVERSAL GRINDERS

1200 Monroe Ave., N.W.

Grand Rapids, Mich., U.S.A.

Carry Your Grinder to the Work Not Your Work to the Grinder

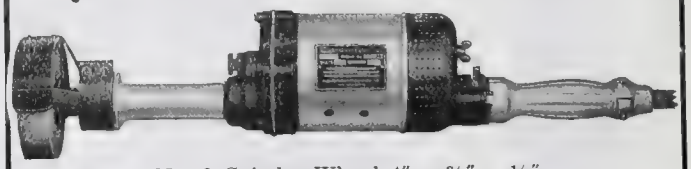
Thor

Portable Electric GRINDER

Equipped with Universal Motor for Operating on Direct or Alternating Current

110 TO 250 VOLTS

(Licensed Under Burke Universal Motor Patent.)



No. 6 Grinder-Wheel 4" x ¾" x ½"

ATTACH TO ANY LAMP SOCKET

Thor Portable Electric Grinder is equipped throughout with ball and roller bearings, and has a specially constructed motor, insuring speed, power, ease of operation and increased capacity.

IT RUNS AT 4,500 R.P.M.

Independent Pneumatic Tool Company

Office: 334 St. James Street, MONTREAL, QUE.

Toronto: 32 Front St. W.; Winnipeg: 123 Bannatyne Ave. E.; Vancouver: 1142 Homer Street

Yes— it does look bad

AND if you haven't a Walton Tap Extractor, this broken tap is going to give some trouble before it comes out.

You're going to fuss around, lose your temper, perhaps injure the thread and waste half an hour or more in addition.

But with this Walton Tap Extractor a broken tap presents no difficulties.

The crucible steel fingers go down into the flutes, and the rest is easy. Just apply a wrench to the squared outer end and back the tap out. Can you imagine anything more simple?

The Walton Co.

HARTFORD
CONN.

Write for Circular

Most Shell Factories

are now using our

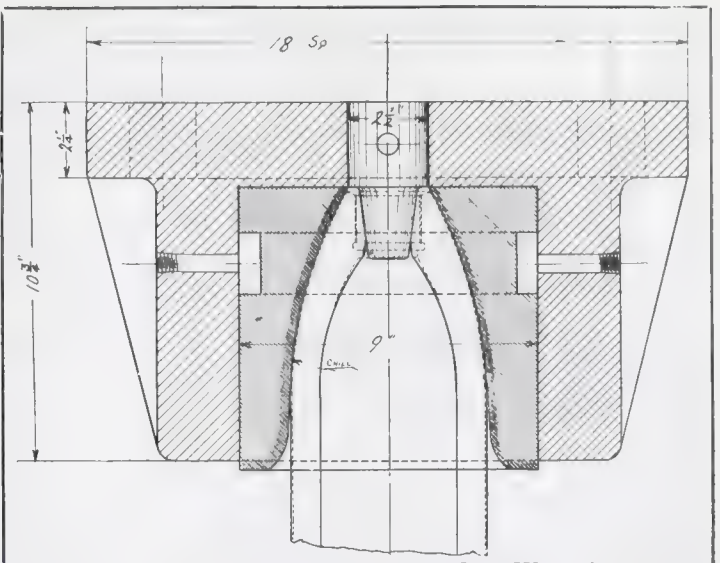
NOSING DIES

of

Chilled Cast Iron

for

4.5-in. 5-in. and 6-in. Shells



Nosing Die-Holder and Die for 6-in. Mk. III H.E. Shells.

Why Not You?

MARSH & HENTHORN, LIMITED

BELLEVILLE, ONTARIO, CANADA

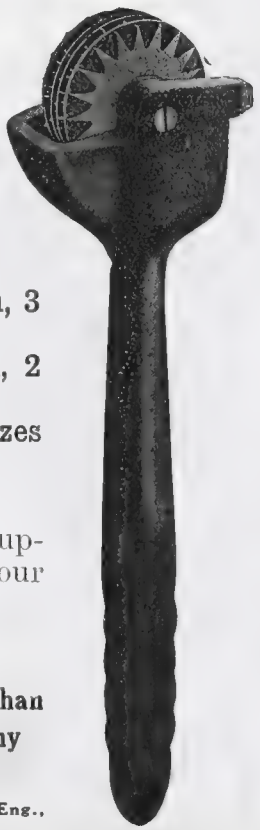
Grinding Wheel Dressers

We are specialists in Grinding Wheel Dressers and can recommend the best types for any particular needs.

Our Dressers are:

Diamo-Carbo
Desmond Huntington, 3 sizes
Sherman Corrugated, 2 sizes
Norton Zig-Zag, 2 sizes
Magazine
Diamonds

We can promptly supply your needs from our stock.



The
Canadian Desmond-Stephan
Manufacturing Company
HAMILTON, ONTARIO

Alfred Herbert, Ltd., Coventry, Eng., Agent for Great Britain.

Stow Shell Grinders Increase Production

Suspended Pedestal Mounted on Truck

Any Size Any Current

Immediate Shipment

Stow Manufacturing Co.

Binghamton, New York, U.S.A.

Oldest Portable Tool Manufacturers in America

A Page From a Carborundum Service Man's Note Book says:

"Our Customer Considers this an Extraordinarily Good Performance"

The job is grinding, rough from the sand, chilled iron rolls on a Landis special grinder. The rolls are 32 inches long, 16 7/16 inches in diameter and 7/16 stock is removed. It takes the Carborundum Wheel, 24 grit, L grade, G 3 + bond just 4¾ hours to do the work.

¶ The finish is uniform, the wheel cuts clean and it loses but 1/15 of an inch.

¶ It is the unbeatable grinding combination that gets these results. —The right wheel, Carborundum service and a good grinding machine.

What can this service do for you?

THE CARBORUNDUM COMPANY
NIAGARA FALLS, N. Y.

NEW YORK CHICAGO PHILADELPHIA CLEVELAND CINCINNATI BOSTON PITTSBURGH
MILWAUKEE GRAND RAPIDS

MODERN

SELF-OPENING and ADJUSTABLE DIE HEADS

The Die Heads that have made good on every threading operation, and which are constantly meeting the demand where Die Heads are required for accurate thread-cutting.

In purchasing "MODERN" Die Heads you have the assurance that you are getting tools of "quality," mechanically perfect in design and construction and uniformly efficient in all sizes.

Illustration shows an installation of "MODERN" Die Heads threading Shell Ogives, where the requirements are precision and large production.

Complete information regarding the use of "MODERN" Self-Opening Die Heads upon request.

MODERN TOOL COMPANY

Main Office and Works:
State and Peach Sts. - Erie, Pa., U.S.A.

Canadian Agents:
Rudel-Belnap. - Toronto - Montreal

F. WESLEY PARKER
Resident Engineer and Export Agent,
2 Rector Street, New York

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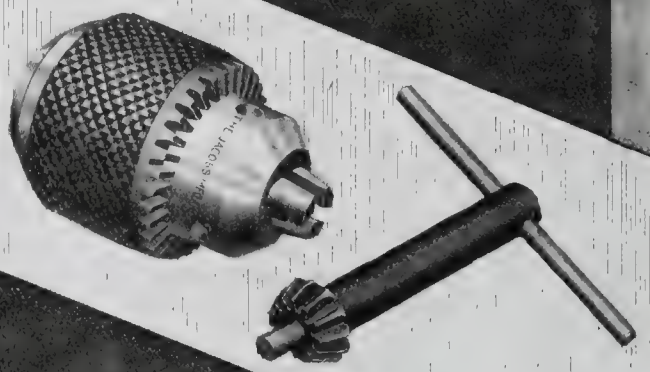
Jacobs
IMPROVED
Drill Chuck



A Winner
By Sheer Merit

Jacobs Improved Drill Chucks are recognized as the STANDARD the world over. Once tried—always used.

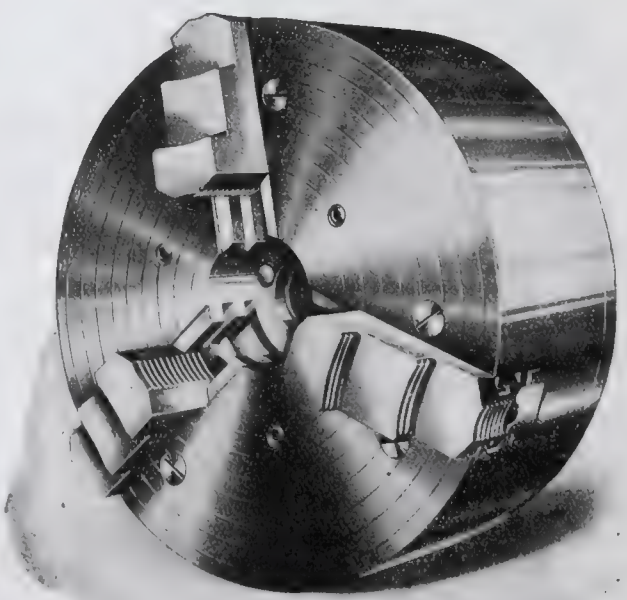
Try them and see for yourself.

MADE BY
The Jacobs Manufacturing Co.
Hartford, Conn., U.S.A.

Think of it——
A 20 to 90% Increase in Production

THE M. E. C. Three-Jaw Air-operated Chuck shown herewith eliminates the waste usually experienced in ordinary chucking processes. It takes all classes of work of the hand-operated chuck, but grips much better and gives top-notch service day in and day out. Only the best materials obtainable go into its manufacture. It is made entirely of steel, including the body. A special process steel is used in making the actuating levers and all parts subjected to strain. The M.E.C. Three-jaw Chuck will do good work long after others have been discarded. Take it on thirty days' free trial.

Write for catalog on all M.E.C. Labor-Saving Devices.



Manufacturers Equipment Co.

171 North Jefferson Street, Chicago, Ill.

Also makers of M. E. C. Two and Three-Jaw Air-Operated Chucks, Expanding Mandrels and Collapsible Taps

CANADIAN AGENTS:

J. R. Stone Tool & Supply Co., Goebel Bldg., Detroit, Mich.

HANNIFIN

Air Chucks on 6" Shells

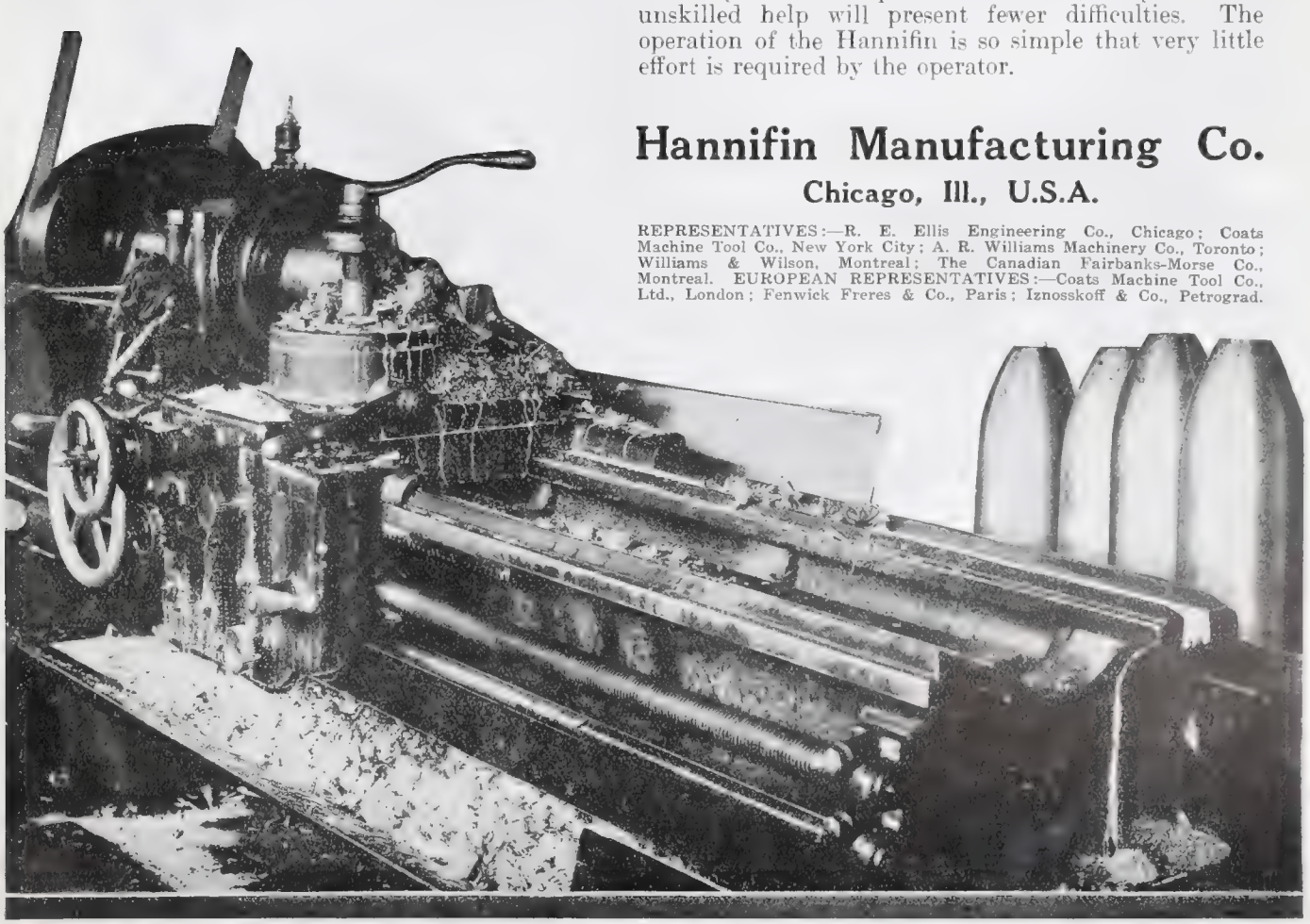
Our catalog will tell you some very interesting facts about these chucks. Send for it to-day.

On munition work Hannifin chucks have demonstrated their time and labor-saving features in a marked manner. The photograph shows one of a long line of lathes boring six-inch shells—all equipped with Hannifins.

In your own plant whether you are making shells or whether you are doing general manufacturing, Hannifin Air-Operated Chucks will aid you to speed up production.

Their instantaneous action, positive grip and ease of operation will save time to the extent of increasing output 20 to 100 per cent.

And if you have adopted female labor, the problem of unskilled help will present fewer difficulties. The operation of the Hannifin is so simple that very little effort is required by the operator.

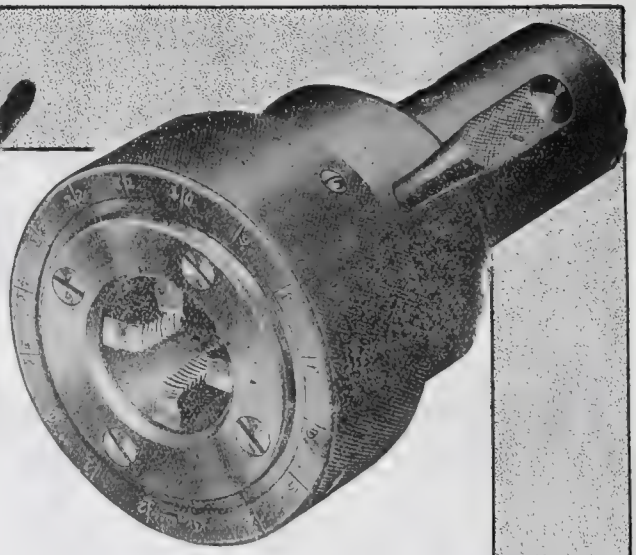


Hannifin Manufacturing Co.

Chicago, Ill., U.S.A.

REPRESENTATIVES:—R. E. Ellis Engineering Co., Chicago; Coats Machine Tool Co., New York City; A. R. Williams Machinery Co., Toronto; Williams & Wilson, Montreal; The Canadian Fairbanks-Morse Co., Montreal. EUROPEAN REPRESENTATIVES:—Coats Machine Tool Co., Ltd., London; Fenwick Freres & Co., Paris; Iznosskoff & Co., Petrograd.

Murchey



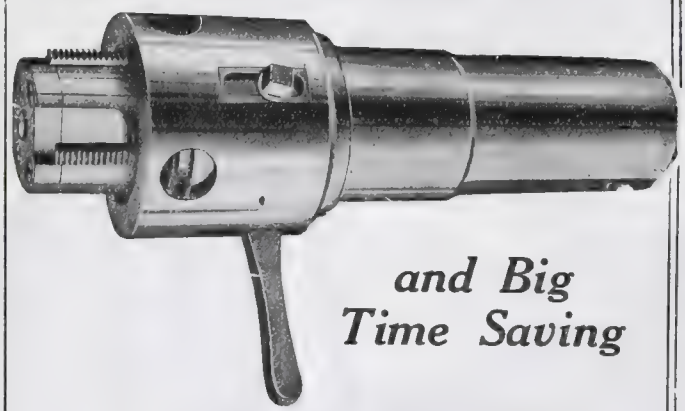
COLLAPSING Taps are superior to other types of taps for many reasons. A study of their construction will show that individual chasers may be adjusted (this allows you to compensate for any wear). When the chasers are finally worn out a new set may be inserted. The adjusting features maintain absolute and original accuracy of the chasers. (What happens a solid tap after first sharpening?) When in operation all parts are rigid and have the stability of a solid tap, yet with ease and convenience the adjustments may be effected.

These are a few of the facts that have put the Murchey Taps in their place as leaders in efficiency and service. We maintain a special chaser service for our clients. An investigation will reveal how great savings may be effected.

Murchey Machine & Tool Co.
75 Porter St. Detroit, Mich.

The Coats Machine Tool Co., Ltd., Caxton House, Westminster, London, S.W., England. Fenwick Freres & Co., 15 Rue Fenelon, Paris, France.

For Positive Accuracy—



and Big Time Saving

"Victor" Collapsible Taps are simple in construction; the few parts can be made large and strong; the body is machine steel, and the chasers are high-speed; screw adjustment from front end makes it easy to maintain close accuracy; trip is automatic; reset by means of lever. The above features—and others—make the "Victor" a time and money saver for severe service. It is being used by many shell manufacturers.

VICTOR Collapsible TAPS

Victor Tool Company
Waynesboro, Pa., U.S.A.

Your Die Heads

are giving you the kind of threads you are now getting. Do you like them? Is the head consuming too much of your time, adjusting and repairing? H. & G. Automatic Self-opening Die heads eliminate all that. The **chasers** are locked, and no stoppage or changing in size required. The **quick release** allows cutting to a certain point each time. It also permits cutting right up to the shoulder when necessary.
Our booklet will tell you all about it. Write for it, anyway; it is valuable to have around.

EASTERN MACHINE SCREW CORP.

H & G

NEW HAVEN, CONN., U.S.A.

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

Every Butterfield Tap comes to you ready for long, hard service.

It is made by expert workmen—from the finest materials obtainable—and thoroughly tested before shipment.

For the tap that is uniformly dependable in service — specify Butterfield.

Butterfield & Co., Inc.
Rock Island :: Quebec

Toronto Office:
1505 Traders Bank Building : Phone Main 1382
H. A. HARRISON, Manager

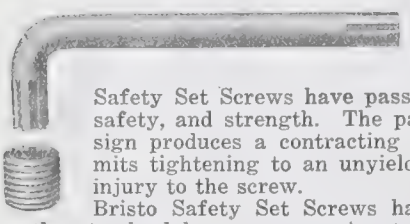
Catalog No. 16 ... Complete line of Butterfield Tools ... awaits your request.

BUTTERFIELD

If any advertisement interests you, tear it out now and place with letters to be answered.

HINTS TO BUYERS

BUILDERS OF MACHINERY WHAT SET SCREWS DO YOU USE?



REG. TRADE MARK
BRISTO
REG. U.S. PAT. OFF.

Safety Set Screws have passed every test for safety, and strength. The patented fluted design produces a contracting effect which permits tightening to an unyielding grip without injury to the screw.

Bristo Safety Set Screws have been adopted as the standard by many prominent machine builders. Ask for free samples and Bulletin I-809.

THE BRISTOL CO., Waterbury, Conn.
U. S. A.

THOUSANDS of Dollars are saved every year by our clients, because we have experts who are trained to make exhaustive tests of all the material you are purchasing, whether raw material or finished products.

CANADIAN INSPECTION AND TESTING LABORATORIES, LIMITED

Head Office and Main Laboratories—MONTREAL

Branch Offices and Laboratories:
TORONTO, WINNIPEG, EDMONTON, VANCOUVER, NEW GLASGOW

"THISTLE" BRAND RUBBER BELTING

"Maintenance of Quality"

is our motto, and our experience in the manufacture of belting since the year 1856 should be invaluable to you. Let us tell you all about this friction faced belting. The price will appeal to you.

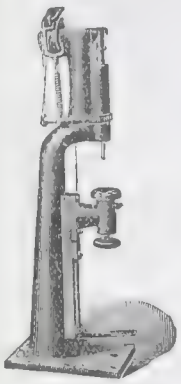
Write to-day.

J. C. McLAREN BELTING CO., LTD.
TORONTO, MONTREAL, WINNIPEG

STEEL CASTINGS

We are well equipped to make all kinds of steel castings, 100 lbs. to 50,000 lbs.

Dominion Steel Foundry Co.
Hamilton LIMITED Ontario



IS YOUR RIVETING PROFITABLY DONE?

Our Elastic Rotary Blow Riveting Machine does profitable work, because one machine will do the work of several hand riveters, and do it better.

Every head is perfectly formed, any shape, round, flat, oval, rectangular, etc.

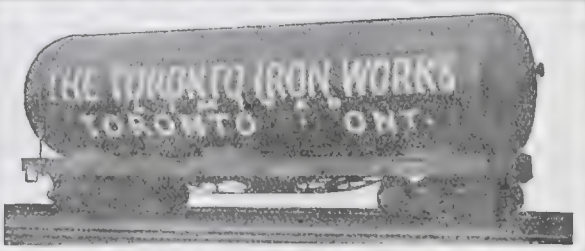
Catalogue C tells more about it.

The F. B. SHUSTER COMPANY
New Haven, Conn.

Formerly John Adt & Son. Established 1866.

Also makers of Wire Straightenors and Cutter, Cotter Pin Machines, etc.

RIVETED STEEL TANKS FOR EVERY PURPOSE



OIL STORAGE - GASOLINE TANKS - AIR RECEIVERS
PNEUMATIC WATER SUPPLY TANKS - SMOKE STACKS
BOILER BREECHING - RIVETED STEEL PIPE BINS & HOPPERS

WE MANUFACTUR RIVETS of every description, ½ inch. dia. and smaller

PARMENTER & BULLOCH CO., LTD.
GANANOQUE, ONT.

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

Style D—3 Sizes
Selected plain or quartered oak or leatherette covered.

UNION Tool Chests

Mean Great Saving of Tools

Compact, roomy, a place for every tool. You know immediately if one is mislaid or borrowed. Drawers strong and perfectly fitted, some lined with felt. Keeps tools safe, clean and free from moisture.

WRITE FOR OUR CATALOG AND PRICES

If dealer near you does not carry "UNIONS" in stock, get our special offer.

UNION TOOL CHEST WORKS
28 RAILROAD STREET - ROCHESTER, N.Y.

SKINNER DRILL CHUCKS

New Model

THE LARGEST ASSORTMENT Made By Any Manufacturer

The "New Model" is especially adapted to rapid, sensitive drilling. It is accurate, light, strong and hand operated.

The price is surprisingly low. Illustrations of complete line on request.

THE SKINNER CHUCK CO.
Main Office and Factory:
NEW BRITAIN, CONN.
New York Office—94 Reade St.
London Office—149 Queen Victoria St.
San Francisco Office—Rialto Building

Zenith Coal & Steel Products Limited

COAL COKE HACK SAW BLADES
CARBON STEEL MACHINERY STEEL
HIGH SPEED STEEL

Royal Bank Bldg., Toronto; McGill Bldg., Montreal, Que.

CLUTCHES

Combined Jaw and Friction. Friction only Gas Engine Clutches. Jaw Clutches.

Write for interesting printed matter.

The Positive Clutch & Pulley Works, Ltd., Canada
MONTREAL Factory: Aurora, Ont. TORONTO

Adjustoglas
TRADE MARK REGISTERED

Resistal reinforced lenses make goggles really protect.

THE STRONG, KENNARD & NUTT CO.
511 Schofield Bldg. Cleveland, Ohio

LANDIS MACHINE CO., INC.
WAYNESBORO, PENNA.

Manufacturers of BOLT and PIPE THREADING MACHINERY

Exclusive Canadian Agents:
Williams & Wilson, MONTREAL, CAN.

Write for Catalogue No. 22

For Hardness Testing

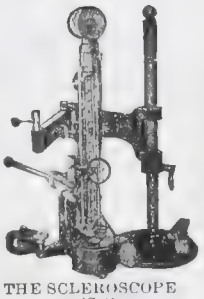
THE PYROSCOPE

in shop and laboratory use the

Standard Scleroscope

Universally adopted; direct reading; inexpensive, and the only instrument that agrees with others of its kind in all parts of the world, thus solving problems of ordering materials to specification.

BOOKLET FREE.

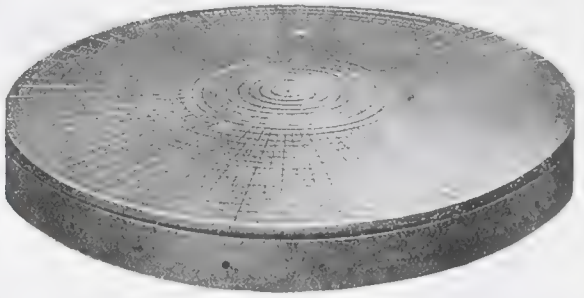


THE SCLEROSCOPE (Set)

Heat Indication

by optical means is fast becoming the correct thing. The PYROSCOPE has solved the problem. Perfect constancy, inexpensive, no electricity used. Built to stand rough usage and upon common sense lines. Used by the Government and best firms.

Shore Instrument & Mfg. Co. 555-7 W. 22nd St. New York
Agents for Canada: A. R. Williams Machy. Co., Ltd., Toronto, Can.



Industrial Cars and Portable Steel Track

Hammant Steel Car & Engineering Works
HAMILTON, ONTARIO

You want Tool Holders that have made good

ARMSTRONG TOOL HOLDERS

Won The

GRAND PRIZE

THE HIGHEST POSSIBLE AWARD AT THE PANAMA-PACIFIC INTERNATIONAL EXPOSITION.

THEY ALWAYS MAKE GOOD

Write for Catalog.

Armstrong Bros. Tool Co.
"The Tool Holder People"
306 N. Francisco Ave., CHICAGO, U.S.A.

SHAFTING

Cold Drawn, Turned and Polished Steel, Rounds, Squares, Hexagons and Flats, Steel Piston Rods, Pump Rods.

Special facilities for Keyseating up to 6 in. diameter.

THE Canadian Drawn Steel Co. Limited
HAMILTON CANADA

If any advertisement interests you, tear it out now and place with letters to be answered.

Metal Testing Instruments

The Brinell Meter
for determining the hardness of metals and metal products.

The Erichsen Machine
for testing metal sheets and strips.

WRITE FOR CATALOGUES

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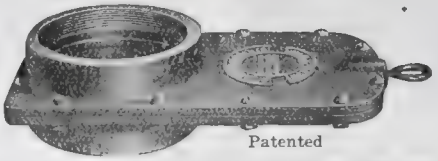

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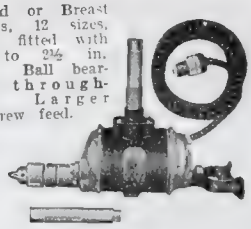

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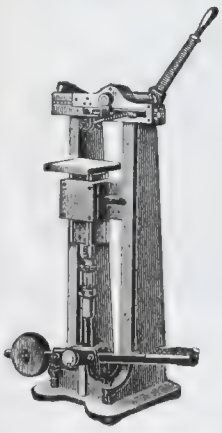

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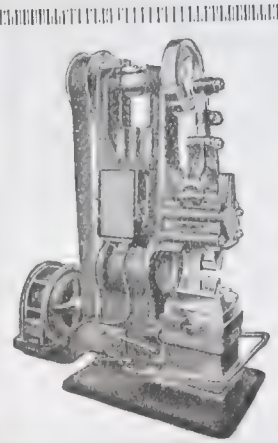

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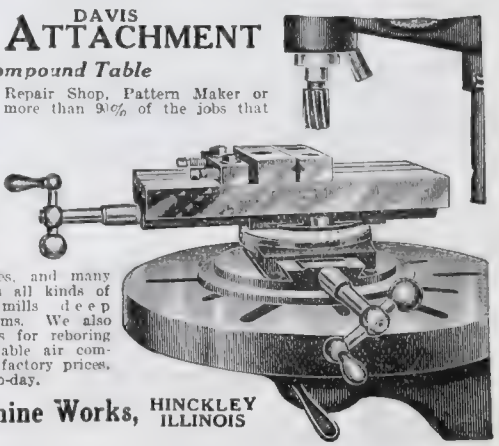

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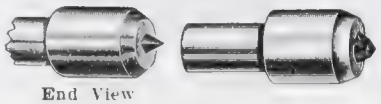
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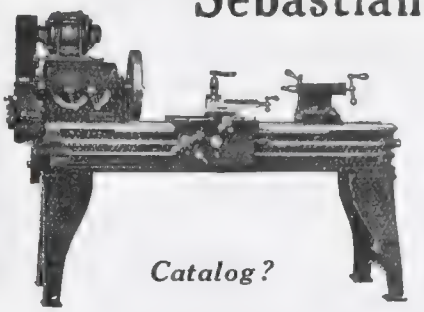

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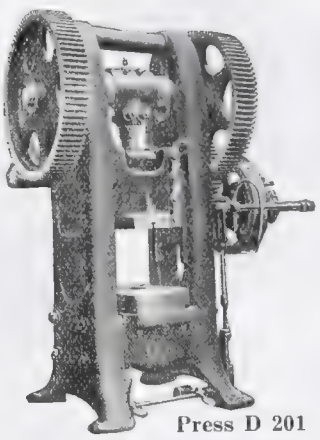
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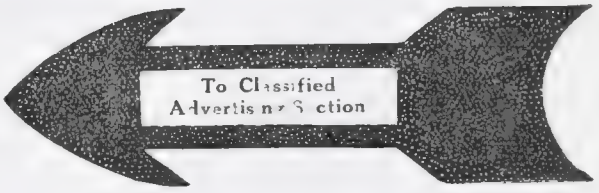

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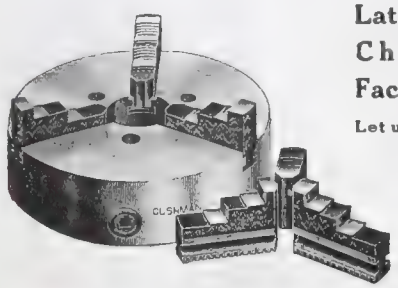

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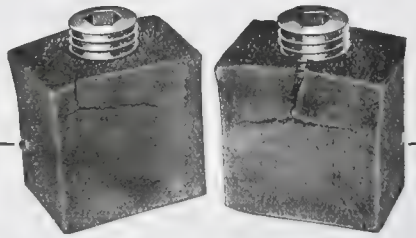

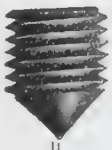

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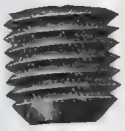

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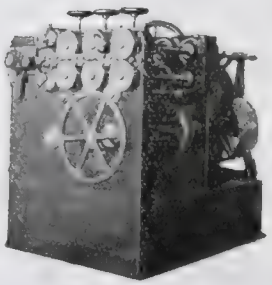

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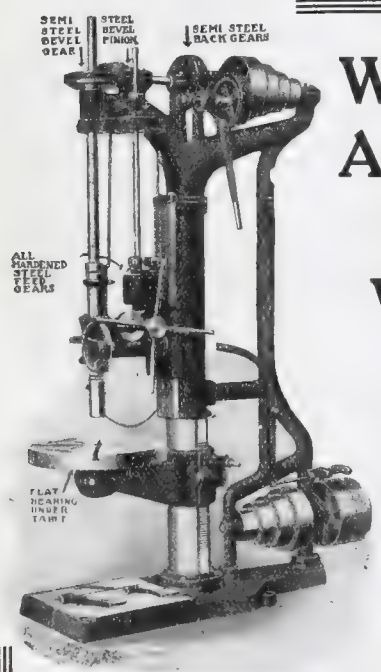

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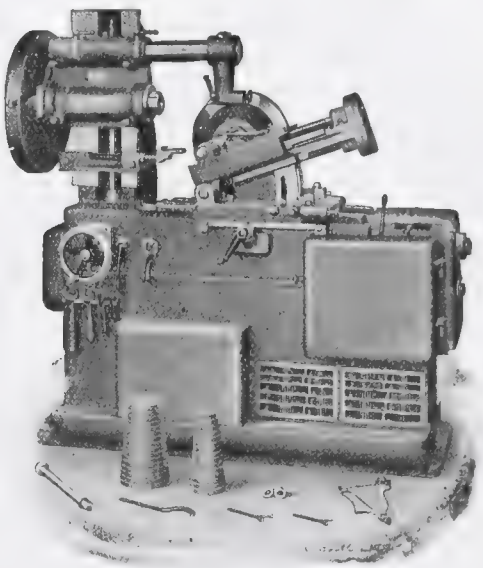

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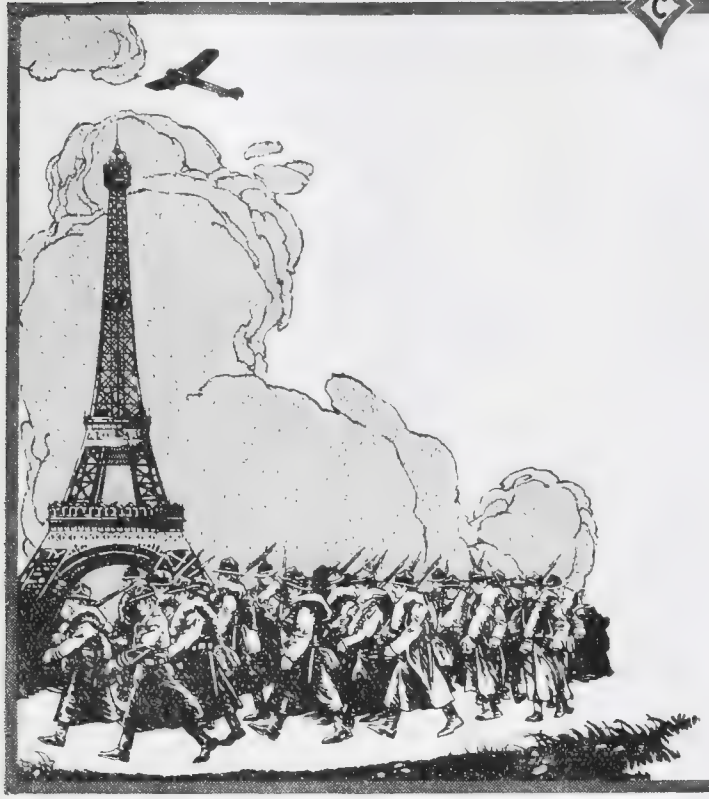

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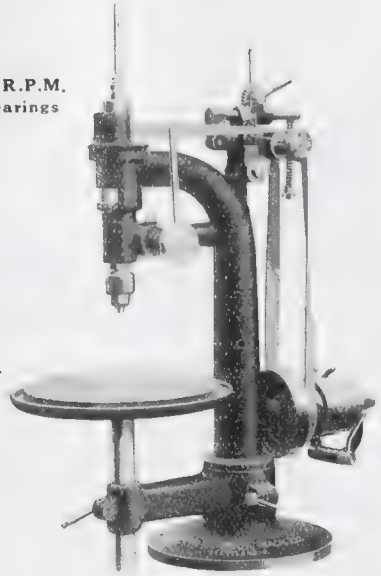

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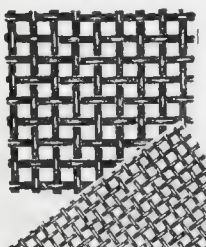

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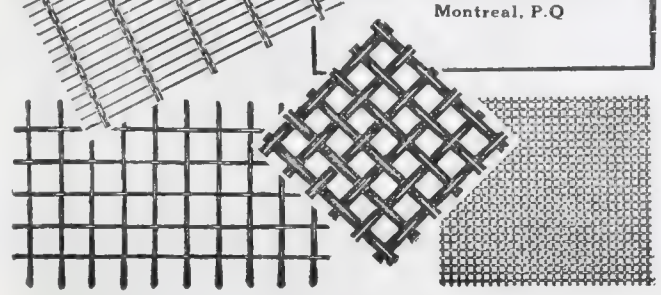

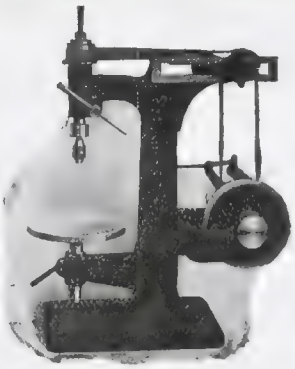

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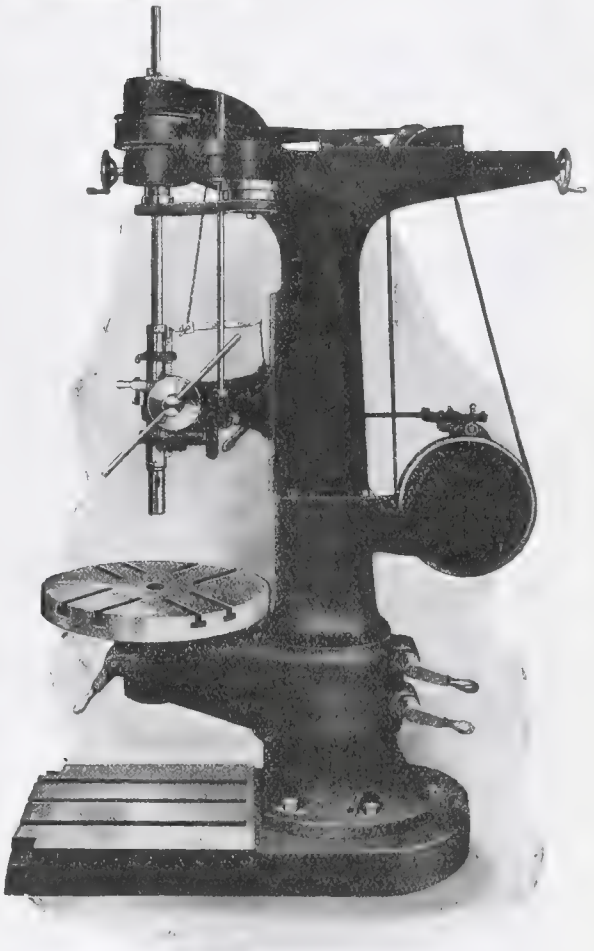

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Brown & Sharpe Mfg. Co., Providence, R.I.
L. S. Starrett Co., Athol, Mass.

INDEX CENTRES
Fred C. Dickow, Chicago, Ill.
Garvin Machine Co., New York.

INDICATING INSTRUMENTS
Taylor Instrument Co., Rochester, N.Y.

IRON ORE
Hanna & Co., M. A., Cleveland, O.

JACKS
Aikenhead Hardware Co., Toronto, Ont.
Can. Fairbanks-Morse Co., Montreal.
Northern Crane Works, Walkerville.
Norton, A. O., Coaticook, Que.
Petrie, Ltd., H. W., Toronto, Ont.

JACKS, HYDRAULIC
Charles F. Elmes Eng. Works, Chicago.

JACKS, PNEUMATIC
Northen Crane Works, Walkerville.

JACKS, PIT AND TRACK
Can. Fairbanks-Morse Co., Montreal.
Northern Crane Works, Walkerville.

JAWS, FACE PLATE
Cushman Chuck Co., Hartford, Conn.
Skinner Chuck Co., New Britain, Conn.

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Homer & Wilson, Hamilton, Ont.
Illinois Tool Works, Chicago, Ill.
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Toronto Tool Co., Toronto, Ont.

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A. R. Williams Machy. Co., Toronto.

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Whitney Mfg. Co., Hartford, Conn.

KILNS
Can. Blower & Forge Co., Kitchener, Ont.
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Sheldons, Limited, Galt, Ont.

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Matthews, Jas. H. & Co., Pittsburgh, Pa.

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Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.

LAG SCREW GIMLET POINTERS
National Machy. Co., Tiffin, Ohio.

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Can. Laco-Philips Co., Toronto, Ont.

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LATHE CHUCKS (SEE CHUCKS)

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Hendey Machine Co., Torrington, Conn.
Rivett Lathe & Grinder Co., Boston, Mass.
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Winnipeg Gear & Engrng Co., Winnipeg, Man.

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Foss & Hill Machy. Co., Montreal.
Garlock-Walker Machinery Co., Toronto, Ont.
Hardinge Bros., Chicago, Ill.
New Britain Mach. Co., New Britain, Conn.
Pratt & Whitney Co., Dundas, Ont.
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Garvin Machine Co., New York.
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Foss & Hill Machy. Co., Montreal.
Foster Machine Co., Elkhart, Ind.
Garlock-Walker Machy. Co., Toronto, Ont.
Hardinge Bros., Inc., Chicago, Ill.
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Foss & Hill Machy. Co., Montreal.
Fox Machine Co., Jackson, Mich.
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Charles F. Elmes Eng. Works, Chicago.
Ferracute Machine Co., Bridgeton, N.J.
Garlock-Walker Machinery Co., Toronto, Ont.
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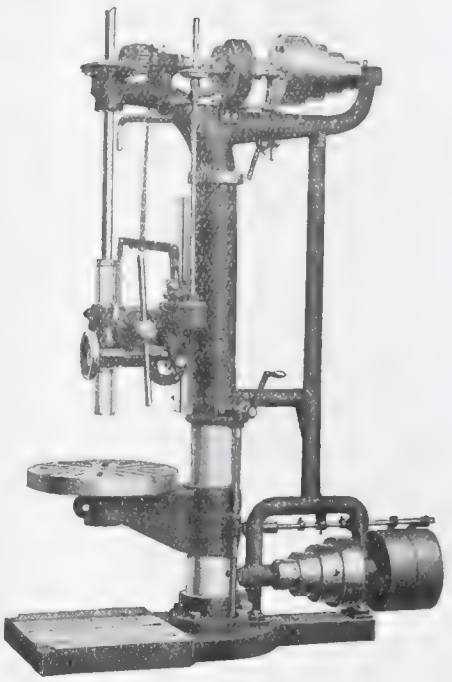

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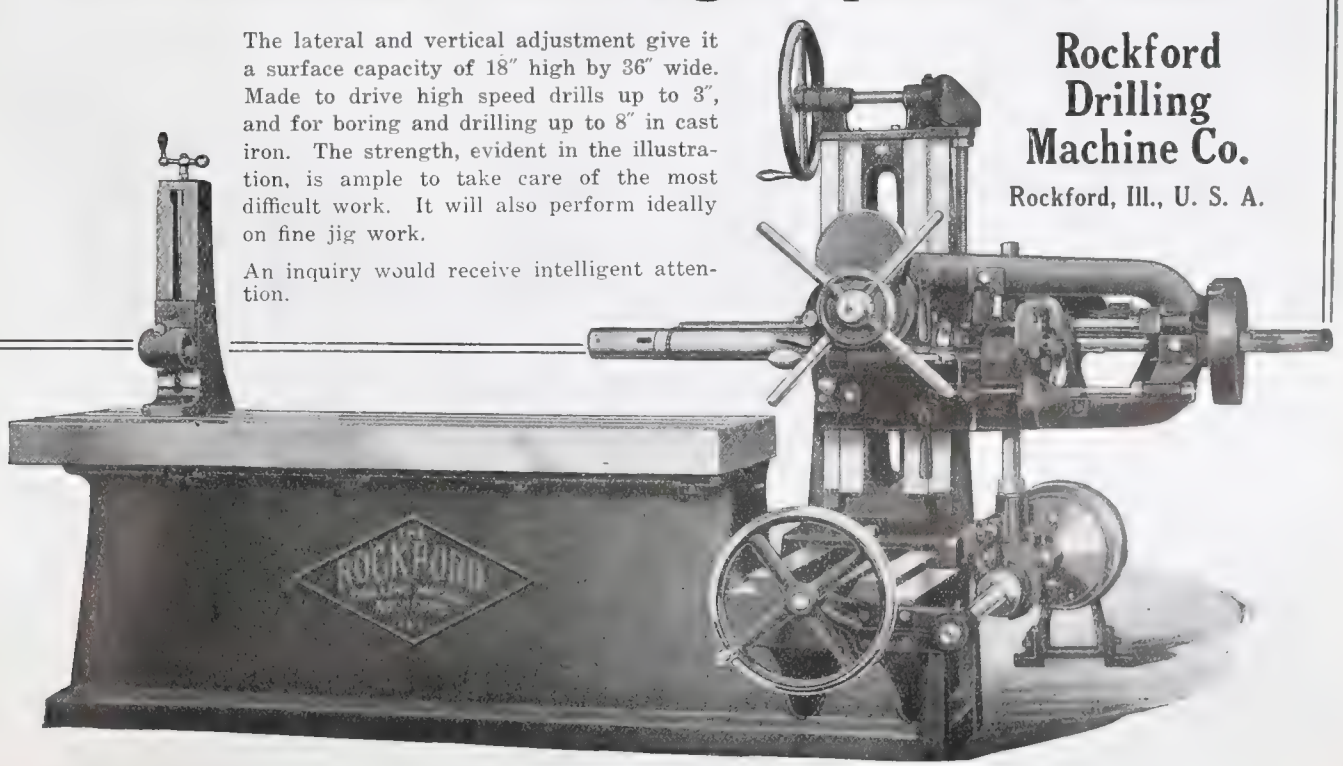

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MacLean's Magazine
For OCTOBER

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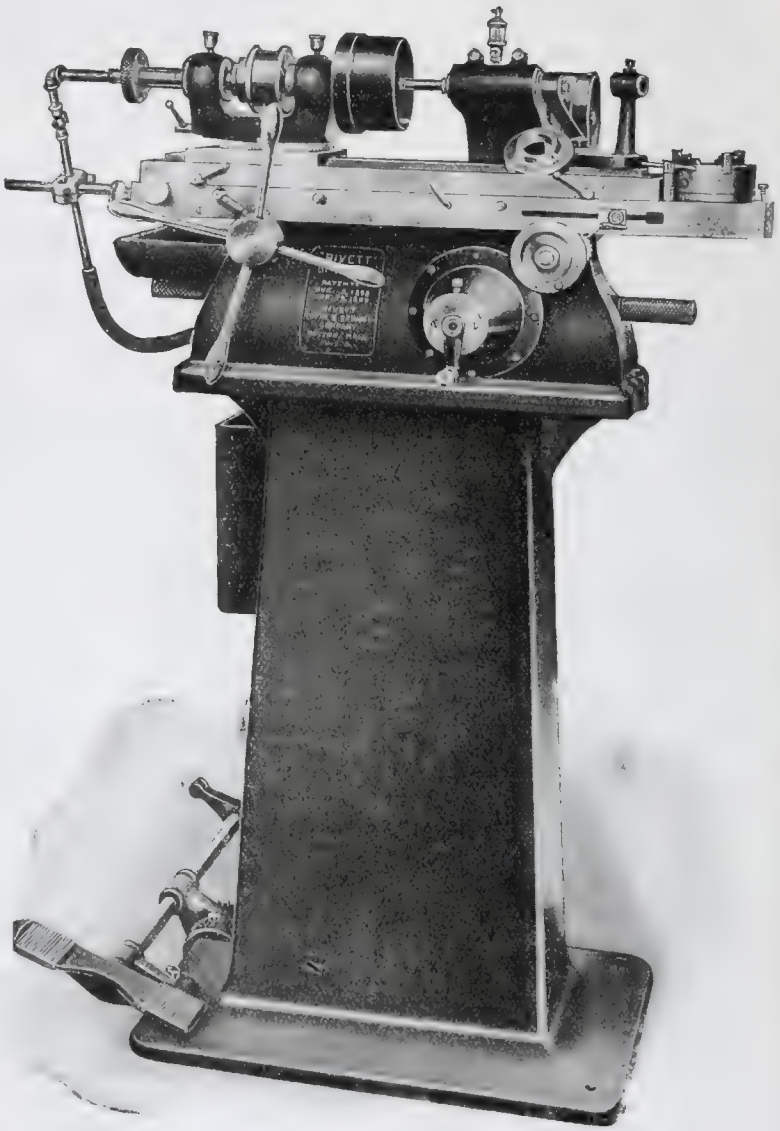

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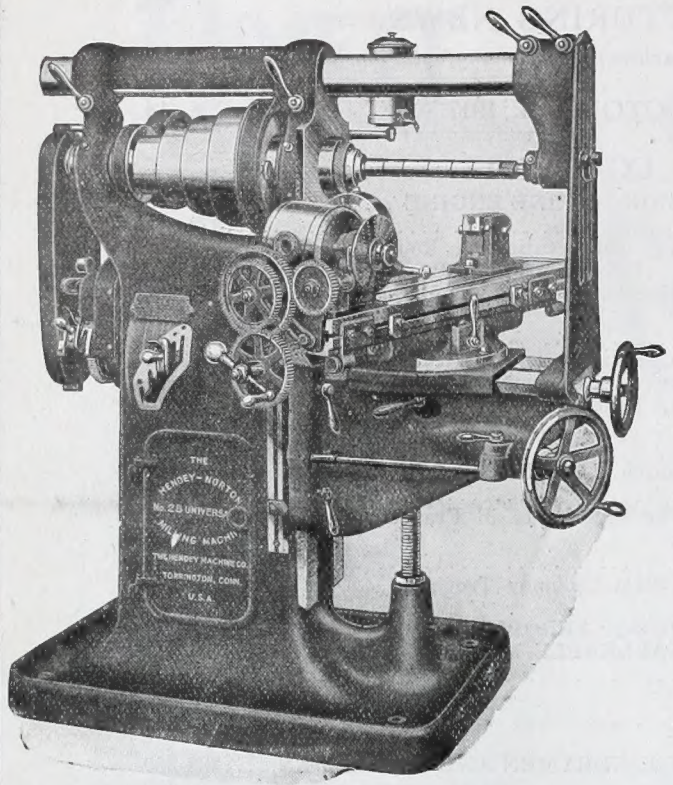

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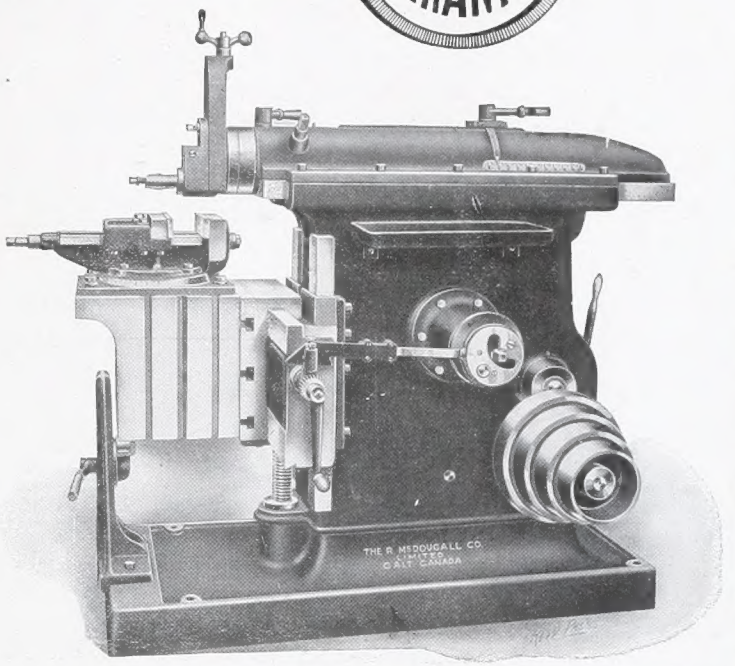

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